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WILDLIFE IN NORTH CAROLINA

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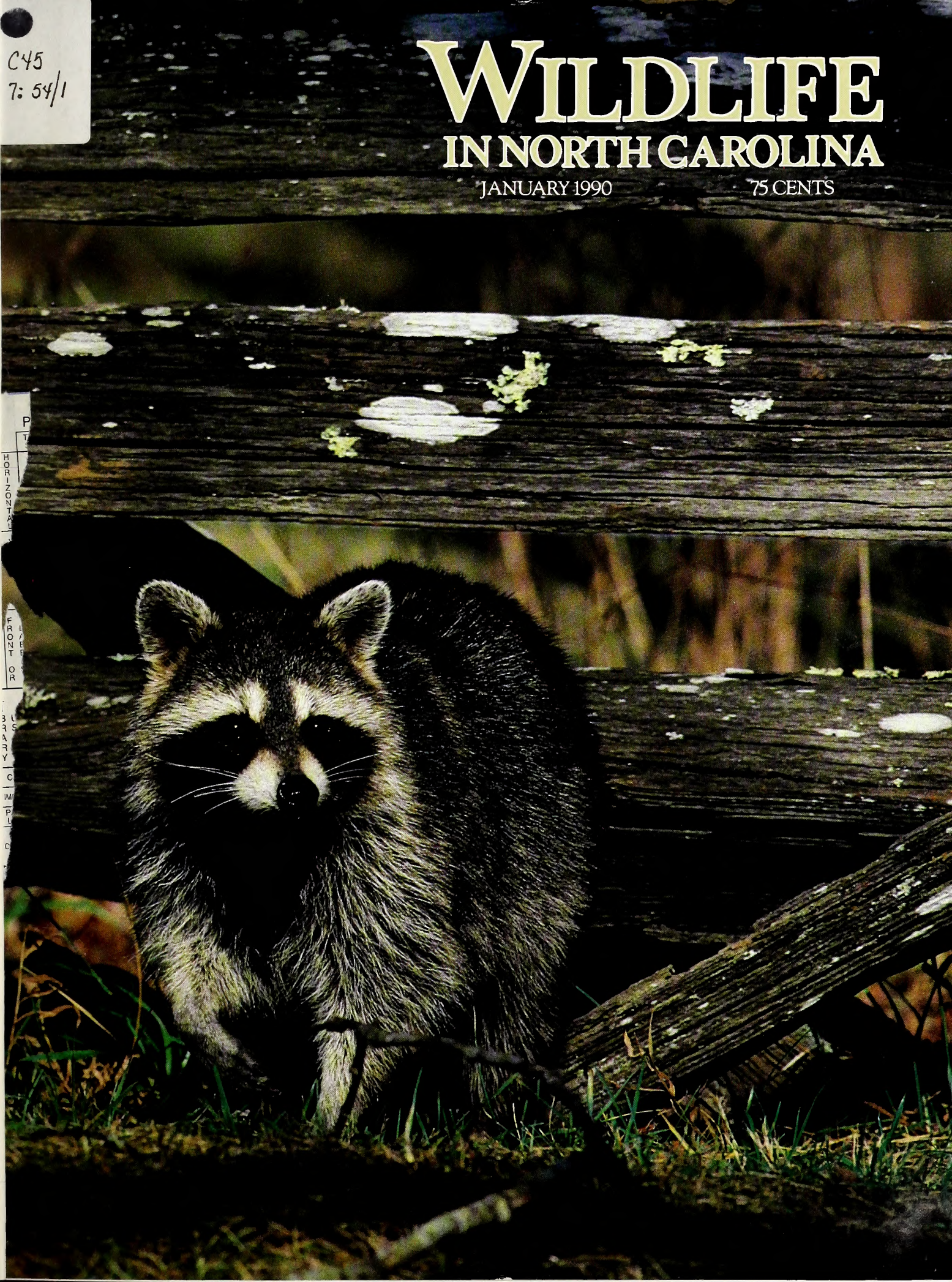


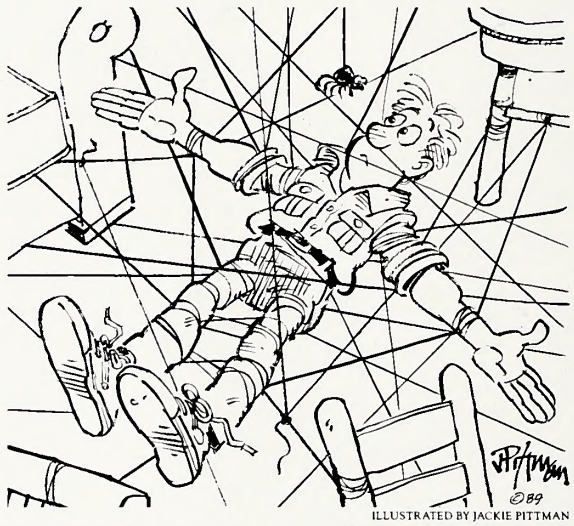
HORIZONTAL
FRONT OR

Confessions Of A Tackle Tinkerer

by Jim Dean

This is the time of year when most fishermen and many hunters are reduced to the peripheral pleasures of their sport which, in most cases, boils down to achieving professional status as a couch potato and causing co-inhabitants to actively consider suicide or, more likely, murder. A sportsman's spare time—of which there is considerable from January until April—is spent in semi-hibernation eating, sleeping, reading catalogs, watching TV fishing shows, and complaining.

There is a persistent myth that this is also the time to repair equipment. Outdoor columns are full of tips under the ubiquitous title "It's Tackle Tinkering Time," a topic apparently chosen for the same reason I have chosen it—there is nothing else to write about.



ILLUSTRATED BY JACKIE PITTMAN

I confess I have little first-hand knowledge of any benefits or pitfalls facing tinkerers, although I did once hear of a fellow who shot himself cleaning his bow and arrow. However, in the interests of science, I wanted to see what I was missing, and set about first to determine exactly what constitutes tinkering. The dictionary gave me this definition: "to busy oneself futilely with a thing; to work unskillfully or clumsily at anything." I can handle that, I figured. The second task was to decide what needed tinkering with most. Why not, I thought, grease my fly lines so that I would not have this task to do next spring? A capital idea.

I pulled out all my fly reels and began to strip off the lines and seek some way of stringing them out. Each line is 90-feet long, so it quickly became apparent that this is one of those tasks best done outdoors—where, of course, it was raining. Not to worry, I looped the end of a line to a chair in the living room, then walked through the hall, a bedroom and the kitchen, arriving at the end of the line, so to speak, approximately back in the middle of the living room where I tied it off on the leg of the coffee table. Six lines later, the house was beginning to resemble a giant spider web with me and the coffee table fixed more or less permanently in the center. With some difficulty, I was able to negotiate my original passage, and get all the lines (and myself) well greased.

Encouraged by this success, I decided to repair several small leaks in my waders. As every fisherman knows, holes in waders are invisible even though they have the same capacity to transfer icy water as a 6-inch pipe. Why not, I thought, hang the waders by their suspenders on a nail in the basement, then fill them with water? I could easily spot the leaks, and mark them with a piece of chalk.

I found a convenient nail and carefully checked the suspenders to make sure they would support the weight once filled. A garden hose served admirably to fill the waders. I was standing there watching the telltale spurts of water and congratulating myself on the wisdom of checking the strength of the suspenders when the nail pulled out of the wall. No doubt wader manufacturers prosper from such calamities, and my check for a new pair is in the mail.

In all the tinkering columns I have read, there is an enthusiastic recommendation to clean out your tackle box, removing all items that you don't use. This is simple enough, though it wrongly assumes that you have only one tackle box. I spread newspapers on the living room floor and dumped out the contents of my boxes, making a mental note never to do that again. All lures have hooks and all hooks are efficiently designed, thus all 473 lures were immediately joined. Several tedious hours later, they were separated, although some took advantage of my momentary inattention to reattach themselves to their neighbors. It was like trying to enforce voluntary birth control in a rabbit hutch.

I replaced the lures and other various items in the box, considering the merits of each, and discarding any worn out or unnecessary gear in a large plastic trash bag. When the tackle boxes were again full, I carried the bag to the trash. In it were two pipe cleaners and a split shot.

Winterizing my outboard motor was my next tinker target. I do not actually know what winterizing means, but it is the term tinkering experts use. In the absence of any clear instructions, I simply disassembled it, spreading the parts on newspapers in the living room (the basement was still a bit damp). It is astonishing how much oil and gasoline there is inside an outboard motor. Let's just say that it's a good thing Exxon did not try this trick at Valdese or matters would have been much worse. Also, be advised that newspapers do not soak up nearly as much oil and gas as, say, a rug.

Perhaps I went about this all wrong, but I think it is fair to say that pundits who write glowing columns about the joys of mid-winter tackle tinkering should be rounded up, tied securely with fly lines, greased with motor oil and left to squirm on a 4-foot pile of treble-hooked bass lures. As for me, I calculate that there are only 2 months, 30 days, 18 hours and 28 minutes left until spring.

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *A raccoon skirts a split-rail fence while no doubt on the prowl for a meal. Photography by Ken Taylor.*

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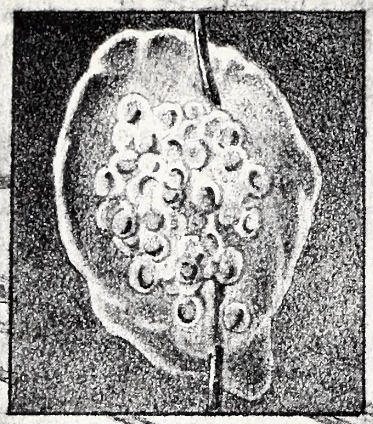
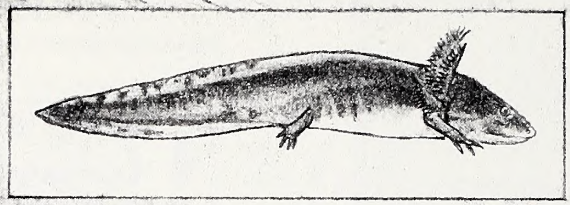
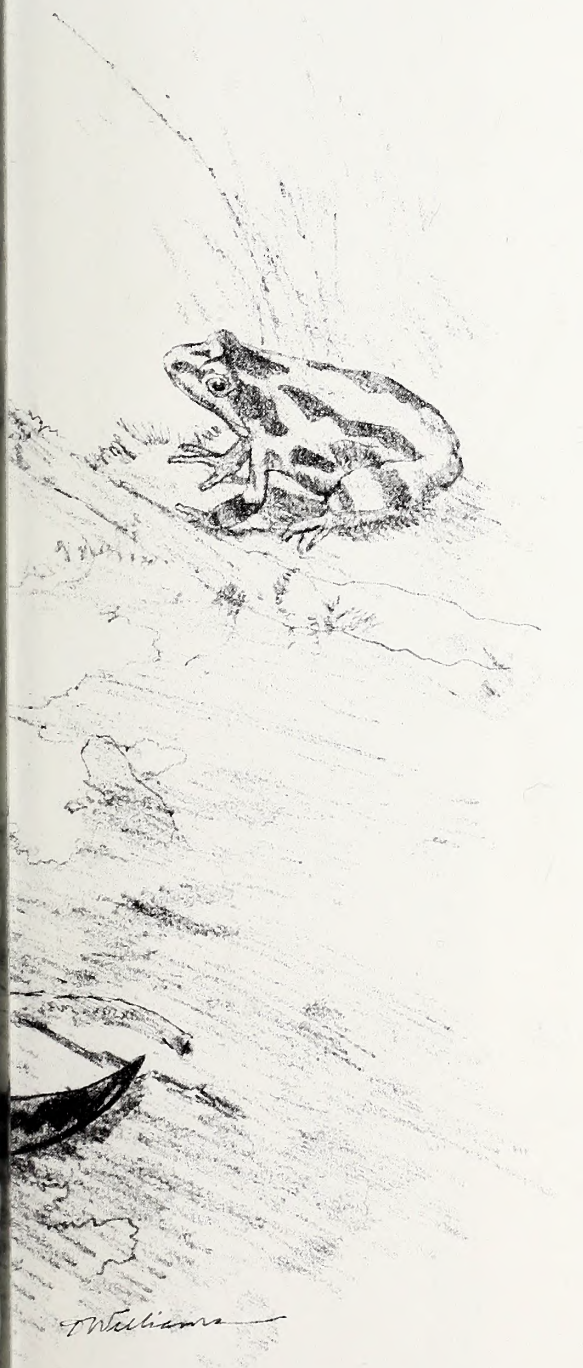




Adult tiger *salamanders lay a jellylike mass of eggs around the stem of an aquatic plant. After hatching, the young salamanders, called larvae, develop in the pond for four or five months while breathing through external gills. They transform into adults in May or June.*



In winter, *the secretive tiger salamander migrates to temporary ponds to breed. Tiger males migrate first, awaiting the females. Terrestrial for the most part, these salamanders are aquatic in the breeding season. Other amphibians also breeding in these ponds at this time of year are the crawfish frog (left) and the ornate chorus frog (right).*

The Tiger Salamander

written by Lawrence S. Earley / illustrated by David Williams

For most wildlife species, winter is hardly the time for breeding. But for the tiger salamander, no sooner does frost coat the pumpkin than this amphibian grows restless with the urge to breed. Thanks to this ancient instinct, now's the only time of year when you may be able to see this rare creature.

That's because most of the year — up to 10 months — the tiger salamander is a land creature, remaining in its burrow about 6 inches below the surface and feeding on earthworms and other critters. In December and January, however, it becomes aquatic, migrating to a nearby pond where it breeds. After breeding, the adults return to their terrestrial life.

Because it's so secretive, scientists know little about the movements and the life history of the tiger salamander. The species' name no doubt comes from its coloration which features dull yellow spots and bars across a dark background. It grows to lengths of 7 to 11 inches. In North Carolina, tiger salamanders are today confined to the edge of the Sandhills — in Robeson, Hoke and Scotland counties — although they were once more widespread in the state. Because of its loss of breeding habitat, the tiger may soon be listed as threatened here.

Historically, tiger salamanders evolved to take advantage of temporary ponds. Thousands of Carolina bays in the Coastal Plain provided important habitat for the tigers, but over the years many if not most of the bays have been ditched and drained. The loss of this habitat has been been calamitous for the tigers. Temporary ponds are essential to their survival because year-round ponds contain fish, dragonfly nymphs and other predators that take a dreadful toll on tiger larvae. Because they evolved in temporary ponds, tiger larvae do not have certain protective strategies found in species adapted to permanent water. With their large heads and long, tapering bodies, they are eating machines used to being top carnivores. They have bold, predatory instincts and pounce on anything that moves, behavior that makes them an easy meal for bigger predators.

No doubt their winter breeding schedule evolved primarily to permit the larvae to escape before the ponds dried up, but this behavior also enables the adults to avoid some warm-weather predators such as snakes. The males migrate from their burrows first, remaining in the ponds for as much as two months before the females arrive. The females stay for only a week. Like other amphibians, they lay eggs in jellylike masses which they attach to reeds about 6 inches below the surface of the water. The hatched larvae breathe through external gills.

In May, the larvae transform into adults and leave the ponds to find burrows. As adults, they lose their external gills and their fins, and their skin develops poisonous glands that discourage some predators.

Tiger salamanders repeat their breeding migration year after year, and although not much is known about their movements, scientists have found that most migrate to the same pond and possibly return to the same burrow. They are a long-lived species, surviving sometimes 15 to 20 years in captivity.

If you're lucky, you may discover one of these rare amphibians during the next few weeks. Look hard — you won't see it again until next year.

KEN TAYLOR

Curiosity *wears a* MASK

by Doug Elliott ©1990

An investigative nature serves the raccoon well, except on those occasions when it gets this interesting creature in trouble.

A couple of summers ago, while working as a guide, I backpacked for several miles into a prime wilderness area with a group of folks for a week of backcountry camping. We created a base camp and shared a central cooking fire. At night we suspended our group food between two trees to keep it out of reach of animal scavengers. Because there is some hunting and trapping in the area, I didn't anticipate trouble from camp-raiding four-leggeds that are so common in parks where they are protected and accustomed to raiding campsites. Yet I felt this was an important procedure for new campers to learn so I instructed my fellow campers to do the same with their personal food supply as well. Most of them put their food in nylon stuff bags and hung them in the trees near their tents pitched here and there in the surrounding woods. I did not check to see if every cache had been hung properly because I did not really expect any animal visitors.

But sometimes you get what you don't expect—it's true in the woods and it's true in life. That first night, not long after everyone had settled down, I was startled out of my first few minutes of dozing by the unmistakable clatter of pots, pans, bowls, and Sierra cups. I jolted upright and flicked my flashlight in the direction of the noise. The beam was met by the bright shining eyes and black mask of a handsome young raccoon. It was busily exploring the kitchen area and was upsetting, overturning and walking around in all our carefully cleaned and stacked dishes and utensils. I stormed out of the tent and shooed the coon into the bushes until it disappeared into the darkness. I checked the kitchen area again to be sure that we really had cleared up all the food, and found the cooking area clean (except for the now scattered pots and pans).

That coon didn't come back that night, but the next night it was back again, as hopeful as ever, rummaging around through all

A curious climber, *the raccoon (top) climbed over, under and around the bird house until it tired of the game. Coons are known for their curiosity and playfulness, and also for their sensitive noses and excellent eyesight and hearing.*

WILLIAM S. LEA

Curiosity *wears a* MASK

our dishes again. I charged out of the tent as I had the night before, and the coon again scrambled off into the bushes. But soon it was back. We had been hiking and exploring most of the day and had stayed up late singing and telling tales around the camp fire. It had been a busy, full, satisfying day, so I was not looking forward to working third shift as camp coon chaser. I gave up, pulled my covers over my head and tried to ignore the racket. Soon the coon realized that as good as it smelled, there was indeed no food there. It wandered off into the night, and all was quiet until later on when a new noise—a strident ripping sound—tore me from my peaceful slumber. It was coming from a new direction. Once again I crawled out of my bag to investigate.

I followed the sound to one of the nearby tent sites. There was the coon up in the tree industriously ripping into someone's food bag. The bag was about 6 feet up and tied securely to the trunk of the tree. The coon leapt from the tree and disappeared. While the owner of the food snored away, I untied the tattered bag and took it back to my tent for safekeeping.

I crawled back into my sleeping bag and soon was sound asleep, only to be awakened some time later by what was becoming a familiar wilderness sound—the sound of coon teeth ripping nylon, this time from a new direction. I headed off to investigate and sure enough, there was that masked bandit merrily ravaging another happy camper's food cache. This bag had been hung from a line on an overhanging branch, but the owner had pulled the bag up too close to the branch and the coon had simply climbed out on the branch, reached down and hauled the bag in. At my approach the coon beat a hasty retreat, scampering away with a granola bar hanging from its mouth like a big flat cigar. I untied that bag as well and brought it back to my tent. Twice more that night I was awakened by that same sound and had to rescue two more improperly hung food bags. This coon was learning fast. So was I.

By the time I returned from my last rescue mission, the first rosy fingers of dawn were brightening the eastern edge of the woods. I was trying once more to get back to sleep when I heard the sound of coon claws on tree bark right behind my tent. I looked out the rear window and there was that ringtailed rascal climbing after yet another food bag. This bag was hung by a rope and dangling several feet down from a high limb well away from the trunk and several feet off the ground. I watched the coon try to reach down from above, then climb halfway down the trunk and try unsuccessfully to reach out from the trunk and grab the bag. Finally, it slid down the tree and stood on its hind legs under the bag trying to reach the bag from below.

By that time, I had had about enough coon for one night. It was daylight and the coon would not be able to slip off into the darkness as it had all night. I was going to give it a run for its money (or its granola bars). I quickly laced my sneakers, leaped out of the tent with a furious roar, and we began a mad dash through the woods, over rocks and through underbrush. I was keeping up quite well when the coon shinnied up a tall hemlock tree. It climbed out on a branch about 20 feet above my head and gazed back down at me with complacent smugness.

"This ain't no old hobbled up coon dog you're messing with this time, you ringtailed fuzz ball," I hollered, shaking my fist. "I'm gonna learn you a few things."

I cut a hickory switch and started for the tree. That coon's beady little eyeballs nearly popped out of its head when it realized that I was coming up that tree after it. Slowly I climbed, growling ominously, the hickory switch clenched between my teeth. The coon turned tail and moved on higher up the tree. I kept right on climbing, growling malevolently and showing my teeth at the coon. (It's hard not to show your teeth when you are using them to carry a stick.)

I wanted to make an impression on this coon, for the good of our food supply as well as for its own good. Weary from a night of jangling pots and food rescues, I wanted that coon to know humans as we really are. To that raccoon we, no doubt, seemed like harmless, noisy bumbling creatures, whose sole purpose on earth is to bring delicious food into the woods to opportunistic raccoons. I wanted to teach that coon the truth about humans—that we are really the most dangerous creatures on the face of the earth, that we are insatiable and we destroy large parts of the natural world every day, including coons. And like my forefathers, I believed that truth and discipline can be

***When not rummaging** through campers' food bags, coons are most often found up trees where they take refuge. They are skilled climbers. A shortage of old-growth denning trees has forced them to resort to groundhog burrows and rocky crevices.*

WILLIAM S. LEA

most effectively conveyed with the sting of a hickory switch.

Soon the coon was near the top of the tree nervously climbing back and forth in the upper branches. I just kept climbing and growling. Realizing it was trapped, and that I was closing fast, it climbed out on the longest branch it could find. But because we were almost at the top of the tree, the branch was only about 5 feet long. By the time I got there, the coon was desperately hanging onto the flexible outer branches at the very end of the limb.

It was enough to melt my heart to look into the fearful eyes of that pitiful coon as it cowered there frantically clutching the green boughs with its delicate fingered front feet. All I really wanted to do was to comfort the little rascal, but I knew that the best thing I could do for this free-spirited animal was to teach it to associate humans with fear, pain, and danger. So I drew forth my hickory switch and began what I'd climbed so far to administer.

The coon turned and took a flying leap. It grabbed a few branches on the way down to slow its descent, then for a 25-foot free fall, it spread-eagled its feet and tail like a giant flying squirrel or a miniature bearskin rug. A few seconds later, it hit the ground running. And as far as I know, that coon is still running; running wild and running free. It never came back to our camp that week and I've been to that campsite several times since and have never had any more trouble with raccoons.

Occasionally I recall my treetop session disciplining that coon. That coon might still be traveling along that creek by our campsite, and when it gets a whiff of human scent I hope that it understands the dangerous unpredictability of the human species. Not all are harmless campers, and I hope the memory of a deranged snarling beast with the stinging hickory switch has kept it out of trouble. Given the raccoon's innate curiosity, I'm not certain about that, but I am hardly the first to find this New World creature intriguing.

The raccoon was first described in English in the 1600s by none other than Captain John Smith, who wrote, "There is a beast they (the Indians) call Aroughcun, much like a badger, but useth to live in trees as squirrels doe." It did not take long for the Indian word to be corrupted in English to "a raccoon."

In the same way my night visitor created chaos in my camp, the raccoon created chaos among the early naturalists and taxonomists who tried to classify the critter. Captain Smith thought it was a badger. Linneaus though it was a bear. Some taxonomists thought it was related to Old

Curiosity *wears a* MASK

World viverrid civet cats and mongooses, while others thought it was sort of like a dog. Finally, it was classified as the ring-tailed leader of its own family, *Procyonidae,* which also includes the coatimundi and the ringtail of the Southwest. It is now known among scientists as *Procyon lotor.* The generic name *Procyon* is the name of the Little Dog star. *Lotor* means "one who washes."

One of the most persistent beliefs about raccoons is that they wash their food, but more likely this is merely part of their tactile nature. I have had access to a few captive raccoons and have observed this washing behavior. A captive coon will take a piece of food and rub it between its front paws while tasting it and smelling it, then take it to the water dish where it will dunk it in the water and continue to rub it back and forth and mush it around in the water, feeling every detail of its texture and form. Raccoons are sensual beings with sharp eyesight, excellent hearing and a sensitive nose, but what is unique about raccoons is their highly developed sense of touch. Most of what these intelligent creatures know about their world they learn through touch. They love to feel things, and they improve their sense of touch by soaking the tough skin on their front feet to make the skin more sensitive.

A large part of a coon's diet comes from the water — frogs, fish, salamanders, crustaceans, shellfish, turtles, snakes, insects and worms. Coons often feed in shallow water by walking along a creek, lake, marsh or tide pool exploring the bottom with their front feet, turning over rocks, feeling for various animals, and gobbling them up as they are caught. A raccoon, while its "hands" are busy probing the bottom, often appears to be staring off into space lost in a tactile reverie. This allows the animal, while it is foraging, to keep its eyes, ears, and nose above the water, ever alert for danger. Indeed, when a raccoon finds food away from water, it does not indulge in washing either its hands or the food. Raccoons are also fond of fruit, berries, corn, eggs, honey, insects, fresh meat and poultry when they can get them.

There is hardly a stream or shore in the Carolinas, or anywhere in the lower 48 states, for that matter, that isn't occasionally patrolled by a raccoon. They range from Canada south into Mexico and Central and South America. Because of their omnivorous eating habits, raccoons are very adaptable and are found in practically every habitat except the driest deserts and the tallest of the Rocky Mountains. This includes cities and towns. Raccoons are often as numerous as squirrels in some suburbs, where they enjoy a relaxed life-style denning in the chimneys, attics and garages of expensive houses and dining on opulent garbage and pet food left by overfed dogs and cats. And that may not be the only human product favored by coons. One of the first accounts of raccoons adapting to human food came from John Lawson, who wrote in his *History of North Carolina* in 1718 that the raccoon was "the drunkenest Creature living, if he can get any Liquor that is sweet and strong." I know a few people like that.

Raccoons prefer to use large hollow den trees for shelter and refuge, but with the demise of much of the old-growth forest in our state they often have to settle for abandoned groundhog burrows, rocky crevices, and sometimes even culverts and chimneys. Raccoons usually breed between January and March, depending on the climate. The female frequently gives birth to

***Hanging out near** ponds and streams, coons eat frogs, fish and other aquatic creatures and are often seen apparently washing their food before eating. But raccoons are not actually that fastidious. They love to feel things, and by dunking their paws in water while eating, they make their skin more sensitive.*

WILLIAM S. LEA

three or four (but sometimes as many as seven) young after a gestation period of about 63 days. The young stay with the mother at least until fall.

As they get older, the mother coon takes her young on nightly foraging expeditions. A curious and disorderly troop they are, as they range through the woods and along creeks, climbing in the bushes, splashing in the water, catching frogs, turning over rocks, digging in the mud, wrestling and fighting with each other—acting very much like a rowdy bunch of schoolboys. They communicate and express themselves vocally with a collection of sounds. The most common is a birdlike churring sound or a whistling trill. (Thoreau called it "whinnering.") When angered or threatened, they emit growls, snarls, and coarse squalls.

Raccoons do not hibernate, but during winter cold spells when the temperature gets well below freezing, raccoons will "hole up," staying in their dens in a drowsy state until the weather moderates. Sometimes several families will den together.

For several centuries coon hunting and trapping have been important activities. In early colonial days the hides were so valuable that they were sometimes used in place of money as a trade item. The meat was considered to be fine food. The fur is warm and the soft, durable leather was used for ladies' shoes. The oil rendered from the fat was used as a dressing for leather and even as a lubricant for machinery. Eighteenth-century writer Peter Kalm noted in his *Travels in North America* that "the bone of its male parts is used as a pipe cleaner." Nowadays this peculiarly shaped bone (called the baculum) is known as a "mountain toothpick."

Today coon hunting is still a popular sport. The greatest pleasure in coon hunting is getting out and roaming the woods on a frosty night and following the deep bellows of bugle-voiced hounds on a hot trail. A wise old coon is as clever as a fox and uses many tricks to hide its scent and fool the dogs. It runs along the top fences, wades down creeks, backtracks along its own trail, and walks fallen logs to break its scent. Sometimes a coon will "tap a tree"; that is, it will climb a short distance up a tree, then leap to the ground and continue running, often leaving the hounds quite literally barking up the wrong tree. Sometimes a coon will lead a pursuing dog out into deep water and then climb on the dog's head and drown it.

The aim of the hunting pack is to chase the coon up into a tree. This is the first place an inexperienced coon will go. When the hounds have the coon treed they will change the tempo and tone in their voices. This is known among hunters as "barking treed." The hunters will then find their way to the dogs and shine their lights up into the tree. No matter how scared it is, a coon can seldom resist looking down at the hunters and when it does, its eyes shine brightly and provide an easy target. If the coon doesn't show itself, some coon hunters have a special call known as a coon squaller that sounds like a coon squalling in anger or distress. At the sound of the squaller, most coons will look, and some will come down the tree to fight or begin running again.

There are some modern coon hunters who have little respect for their quarry and either throw the body of the coon away or let the dogs tear it up. However, most coon hunters are true sportsmen and realize that this animal they hunt is a noble beast and a precious resource. They work hard to preserve its numbers and its habitat. They kill only a small percentage of the coons they tree, and when they do kill one, they save its hide (which can be sold) and use its meat. The sport of coon hunting is about much more than just coons. It is about the music of the hounds, the adventure of getting out in the woods at night, and the unpredictability of where you may go and what you may find. It is about fellowship with other hunters and about the stories that are told after the hunt.

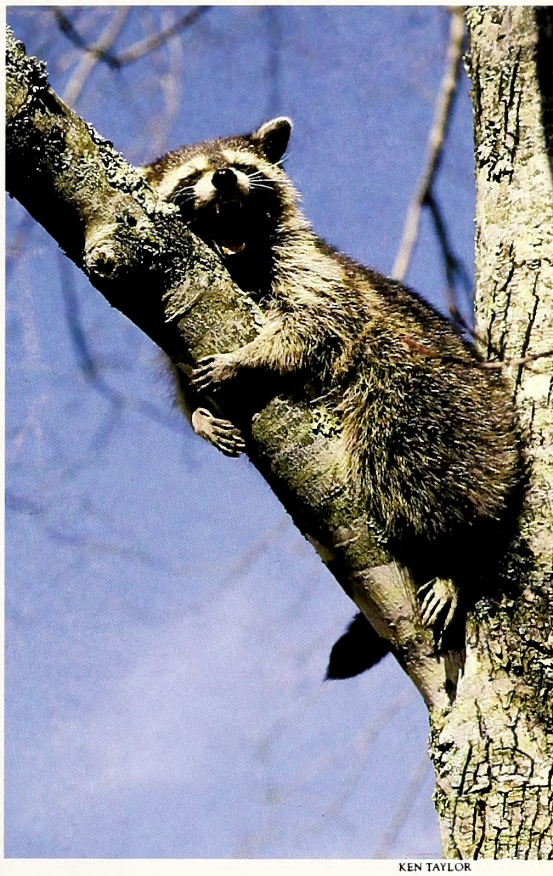
When I was a small boy, my dad told me that once when he was out coon hunting, the dogs chased a coon into a tall hollow tree. He said the hunters saw it run into a hole at the bottom of the tree, and it seemed that no sooner did that coon get into the hole than it popped out of the top of that tree and ran back down the outside of the trunk to the hole at the bottom. Again, it squeezed into the hole in the bottom and as soon as it did, out came a coon at the top that ran back down to the bottom hole again. As this continued, they were amazed. They had never seen a coon act so strangely and wanted to investigate. They got an ax and chopped the tree down. When they did, they saw an amazing sight.

"That tree was plumb full of coons," he told me. "So full in fact that there wasn't even room for one more. As soon as that coon squeezed in at the bottom of the pile, there was no room for the one at the top of the heap and down out of the tree it came, trying to get a place at the bottom of the pile."

"How many coons were there?" I asked, wide-eyed with wonder.

"There were forty seven," he told me, "as near as we could count. . . ."

That's true. It's true that my dad told me that story. It's also true that like a lot of outdoorsmen, he sometimes told tall tales. ⊠



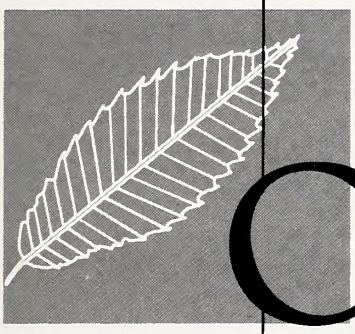
KEN TAYLOR

***Winter days** bring on a general languor among coons, especially during extreme cold. They don't hibernate, but will drowse in their dens until it warms.*

SAGA OF A *FALLEN* MONARCH

U.S. FOREST SERVICE

When blight virtually wiped out the American chestnut in the 1930s, it marked the end of a tree, and also a way of life.



BY JIM CASADA

Once the beautiful and versatile American chestnut adorned vast areas of forest in the eastern United States. From Alabama and Mississippi north all the way into Maine, spreading outward from the mountainous spinal column we know as the Appalachian chain, it was *the* dominant tree in vast tracts of hardwood forest. From pioneer days onward, and for that matter long before Europeans put down roots in the New World, the chestnut held a special place in American life. Among the most predictable of all the nut-bearing trees, chestnuts provided food for man as well as for many of the animals, wild and domesticated, upon which he relied for meat.

Pioneer villages routinely featured a giant of the species as their focal point—a landmark with its saw-toothed, spearhead-shaped leaves affording welcome shade from the summer's heat and a gathering spot for friendly barter, banter, or gossip. Among the best known of all our country's poetry are Henry Wadsworth Longfellow's flowing lines from "The Village Blacksmith":

Under the spreading chestnut tree,
The village smithy stands . . .

The verbal scene drawn by this titan of American letters was one intimately familiar to our forebears. Quite simply, in days gone by, the chestnut was an integral part of life

for millions of rural dwellers.

Functional to a degree rivalled by no other tree, it furnished food for man and beast, but that was but one of its myriad roles. Its wood provided shelter in the form of easily riven shingles and nicely split boards; properly dried it furnished fuel against the winter's cold; and there was no finer fence than one split from chestnut rails.

Most authorities estimate that the species comprised at least 25 percent of all the eastern hardwoods, and over extensive areas it was even more prevalent. Such was the case throughout the mountains and foothills of North Carolina, where the tree grew in virgin splendor or was carefully nurtured and protected when other hardwoods were cut. Marching in verdant ranks up sloping hillsides and steep ridges, ever soaring majestically skyward, chestnuts were the crowning glory of the Great Smokies and Blue Ridge, the Black, Nantahala, and Unaka mountains.

They were as much a part of life for many Tar Heels as their orchards and patches of corn. Beloved for their staunch serenity, standing as a seeming constant in a world where the wolf of poverty was never far from the door, they were inextricably intertwined in a life lived close to the good earth. Sadly, today they are gone, for the American chestnut has become one more part of the world we have lost.

Shortly after the turn of the century, the introduction of a virulent fungus sealed the tree's doom. Widely known as "chestnut blight," the fungus was unwittingly imported in seedlings brought from the Orient. Once the fungus infected the American chestnut, the blight became an all-too-realistic version of the "yellow peril" that preoccupied many political thinkers in the interwar years. Indeed, in the mid-1920s one major national magazine described the fungus in just such a fashion: "Americans routed all along the line! Orientals advancing irresistibly! Devastated area steadily widens as triumph of invaders is complete!"

It was an apt description of the course the fungus took. This blight resisted all efforts (and continues to do so) aimed at a cure. It probably came to the United States shortly after the turn of the century, and by 1910 its ravages were increasingly obvious. By 1950, in the span of less than a half century, virtually all of America's chestnut trees were dead or dying. Recurrent sprouts shooting up from root collars gave tenuous hope for the future. Such sprouts are still common in many parts of western North Carolina, but seldom do they reach a diameter of more than 4 to 6 inches before the blight kills them back. A few much larger trees remain here and there in the state, some even bearing nuts, but these isolated trees are not truly blight resistant.

Isolated stands of trees that settlers had planted outside the chestnut's natural range —in Michigan, Minnesota, and other midwestern states—also gave hope. Yet, recently blight has been found in many of these isolated and, therefore, supposedly safe survivors. As one modern scientist has written, it now seems increasingly clear that "the only viable course of action [is] the identification of other, more resistant chestnut species and their use in a breeding program." It is possible, through the committed work of the American Chestnut Foundation and the implementation of Mendelian genetics, that some of these trees may stand proud and prominent in our forests once more. For now, we can only ponder both the past and the future lessons the chestnut teaches us.

In North Carolina, the chestnut was a staff of life for many. Its mast could be counted on through thick and thin, no matter what the impact of climatic vagaries on other foodstuffs, because it bloomed late and was never frost-killed. Indeed, the word "chestnut" was deeply ingrained in American vernacular. Often those prone to indulge in twice- or thrice-told tales could be shamed into silence when some long-suffering listener muttered "old chestnut." But when it came to food, those who lived in chestnut country knew that in the tree they had a constant ally.

Chestnuts were among the fastest growing of all hardwoods, averaging a centimeter or better annually, and in fertile soil they would be producing ample crops of nuts within a few years. For those Tar Heels living close to nature—and that means virtually everyone who lived in the tree's natural range just two or three generations past—chestnuts constituted an important food source. Family "nutting" outings were an autumn ritual, a welcome change of pace from the daily routine of farm life. As the Indian summer days of early October gave way to the glories of a hunter's moon, the time was at hand for gathering the nuts. And timing was of the essence, for as the protective burrs split open to free the mature nuts, competition became keen.

Humans ate chestnuts, but so did bears, deer, turkeys, gray squirrels, chipmunks, "boomers," wood mice, and other wild creatures. It was a common practice to fatten up hogs in the weeks prior to slaughtering them by allowing the pigs to range freely through the chestnut forests. Many a grizzled gourmet who remembers the days of cracklin' bread and fatback, backbones and ribs, will tell you that no meat can compare with that of a hog that had gorged on chestnut mast.

Similarly, chestnuts played an indirect yet vital role in putting meat on the table in another way. Many families ate squirrels, and nowhere did bushytails thrive as they did in the hardwood forests dominated by chestnuts. From the days of Daniel Boone onwards, pioneers sharpened their shooting eye and provided fresh meat by hunting the plentiful bushytails. Of all small game animals, squirrels are among the best in adjusting their numbers to available food supply, and as long as there were chestnuts in abundance these treetop tricksters were everywhere.

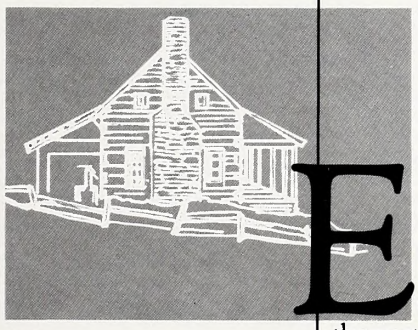
One of my favorite stories from childhood, and it never became an "old chestnut" no matter how many times retold, was my grandfather's account of hunting squirrels in chestnut forests. According to his lively accounts—doubtless embellished a bit but nonetheless carrying the ring of truth—a man could regularly kill a dozen bushytails from a single large chestnut tree at the time when nuts began falling.

Even more plentiful than gray squirrels were the noisy, nimble chipmunks (or ground squirrels, as most mountain folks call them). While ground squirrels were not hunted, they did furnish many a hill-country lad hours of delight. The chipmunks regularly stored chestnuts against the coming hard times of winter, and a favorite adolescent recreation as cold set in during the late fall was to dig into their burrows. There the youthful "hunter" would find anywhere from a quart to a half gallon of chestnuts, and the small treasure trove was doubly welcome in that every nut comprising it was invariably sound. The ground squirrels recognized rotten or wormy nuts as soon as they picked them up, and these would never form part of their store.

The primary collection of nuts, however, came during the course of the aforemen-

tioned nutting expeditions. Almost as agile as squirrels, young boys would climb high into the trees and shake them for all they were worth. The boys sent cascades of nuts tumbling earthwards, clinging fast even as they dodged the prickly, falling burrs. All hands then joined in filling one flour sack after another against the lean times of winter.

The nuts were eaten in a surprising variety of ways. After the chestnuts hung to dry for a time in the sacks in which they had been gathered, their golden meat developed a sweet taste, with just the slightest hint of saltiness, that was truly delicious. Roasted and eaten hot on a bitterly cold day, the protein-rich nuts were not only tasty but wholesome. They were also boiled, much like peanuts are today, and often men and boys carried a pocketful afield as they hunted or worked at their chores. The boiled nuts could be mixed with cornbread to make a superb dressing to accompany the holiday turkey or roast hen, and the Cherokee custom of making chestnut bread was widely adopted by settlers. This delicacy featured a mixture of the meat from boiled chestnuts and corn meal, and if humble fare it was nonetheless fit for the gods.



Not only were the nuts eaten, many families picked up a bit of "cash money" for buying essentials or perhaps Christmas gifts by selling chestnuts. These were shipped by the bushels to cities. There the roast chestnut man with his little grill was a fixture on wintertime street corners, so that even the inhabitants of large cities along the eastern seaboard could enjoy treats from distant forests. When the Depression of the 1930s hit, its impact was unquestionably intensified for many North Carolina hill folk because of the chestnut's simultaneous decline.

For all its importance as a contributor to the food supply, the chestnut was even more valuable in other ways. Straight-grained and easily worked, chestnut wood was a delight to split. It dried rapidly, and the high tannin content of the wood meant that it was remarkably resistant to rot. For this reason, it was a popular choice for poles to carry telephone, telegraph, and electric lines. Similarly, it was widely used for railway ties, prop structure in mines, and fences. Although we today associate the split-rail fences of yesteryear with the locust, in reality most of those in the North Carolina Piedmont and mountains were made from chestnut. Some indication of the wood's durability is given by the fact that scattered rail fences of chestnut still survive.

The high tannin content of chestnut also was important to the leather industry. The bark and heartwood of the chestnut were unrivaled when it came to the tanning process for heavy leathers. Shingles from chestnut were also common, although the fact that the wood was not quite as close-grained as oak made the latter preferable for roofing purposes. It was only after the fungus began to take its toll that chestnut became popular as a house-building material and for use in making furniture. Before then, chestnut was used primarily in the construction of barns and outbuildings.

Even in its death throes, though, the worthy chestnut offered one final benefit. As the trees died and eventually fell to the forest floor, tiny worms ate their way through the wood. Still, it resisted rot, and before long foresters and woodworkers recognized that "wormy chestnut" was a wood of surpassing beauty. The tiny worm holes gave the lumber an eye-catching pattern of infinite variety, and the lovely patina with which it glowed once finished gave wormy chestnut a softness and warmth matched by few woods. Then, too, furniture or panelling from wormy chestnut had a certain aura about it, a mystique, if you will, as if it lived on after death.

I grew up in a mountain home that featured a mantel and desk lovingly crafted from wormy chestnut, and those who first introduced me to the woods always took pains to point out chestnut sprouts, along with those of its cousin, the chinquapin, whenever we encountered them. Looking back, I realize that this was their way of mourning the passing of a treasured friend, of paying richly deserved tribute to a stalwart companion that had been a constant ally in the struggle for survival. Small wonder then that there are still those who sing the praises of this vanished giant and hope that some miracle of science, some genetic breakthrough using crossbreeding from isolated blight-resistant survivors, will herald its resurrection. For now, it must suffice to recall that which once was and to meditate on the poignant tragedy that befell the American chestnut. ⊠

Hope For Chestnuts

The American Chestnut Foundation, founded in 1984 by a group of scientists led by Charles R. Burnham, is dedicated to restoration of the tree. At present, backcross methods seem the most promising, although seedlings from a grove of trees in Michigan are also shipped nationwide each year. As recently as 1987, a sizeable mature tree that has been described as "one of the largest surviving American chestnuts in the entire world" was discovered in Lynden, Washington, and it has been saved to propagate its kind after a last-ditch struggle against a local school board determined to cut it down as part of a planned construction program.

Then, too, efforts to use selective breeding as a means of transferring the blight resistance of the Asiatic species (commonly known as the Chinese chestnut) to the American chestnut continue. On the other hand, earlier programs by both the state of Connecticut and the U.S. Department of Agriculture failed and were abandoned around 1960. The fate of the American chestnut remains uncertain, although the American Chestnut Foundation seems its last, best hope. For details on its programs and membership, write the Foundation at the Department of Agronomy and Plant Genetics, University of Minnesota, 1509 Gortner Ave., St. Paul, MN 55108. Those who would like additional details on the availability and cost of the Michigan seedlings can send a stamped, self-addressed envelope to the Wexford Soil and Water Conservation District, 3060 West 13th Street, Cadillac, MI 49601.

Also, Tar Heel chestnut enthusiasts may be interested in a special issue of a little-known but excellent publication, the *Katuah Journal*, which was entirely devoted to the tree. Although this particular issue appeared a few years ago, some copies are still available for $2.50 (this includes postage and handling) from the publication's offices, P.O. Box 638, Leicester, NC 28748; telephone 704-683-1414.

Our Coastal Colony Nesters

WILLIAM WALKER GOLDER

Many coastal birds nest together, and protecting the places where they raise their young is the key to their survival.

by Tom Henson
photography by Ken Taylor

It wasn't hard to figure out that water birds inhabited the island. Scores of them were in the air, flashing patches of characteristic bright white feathers. And even if they hadn't been visible, we would have known they were there by the intense aroma of fish that greeted us as we maneuvered the boat from downwind.

The scene we witnessed, as we waded ashore, is one of the great spectacles of nature. In virtually every area of bare sand were closely packed nesting terns — thousands of royal terns and hundreds of sandwich terns in intermixed colonies. To the east, in dense stands of grasses and other vegetation, were thousands of laughing gulls attending their well-hidden nests. In a small clump of shrubs, several tricolored herons sat on crude nests built from sticks and vegetation. Overhead, the sky was filled with raucous birds voicing displeasure at our presence as they carried food to mates and young.

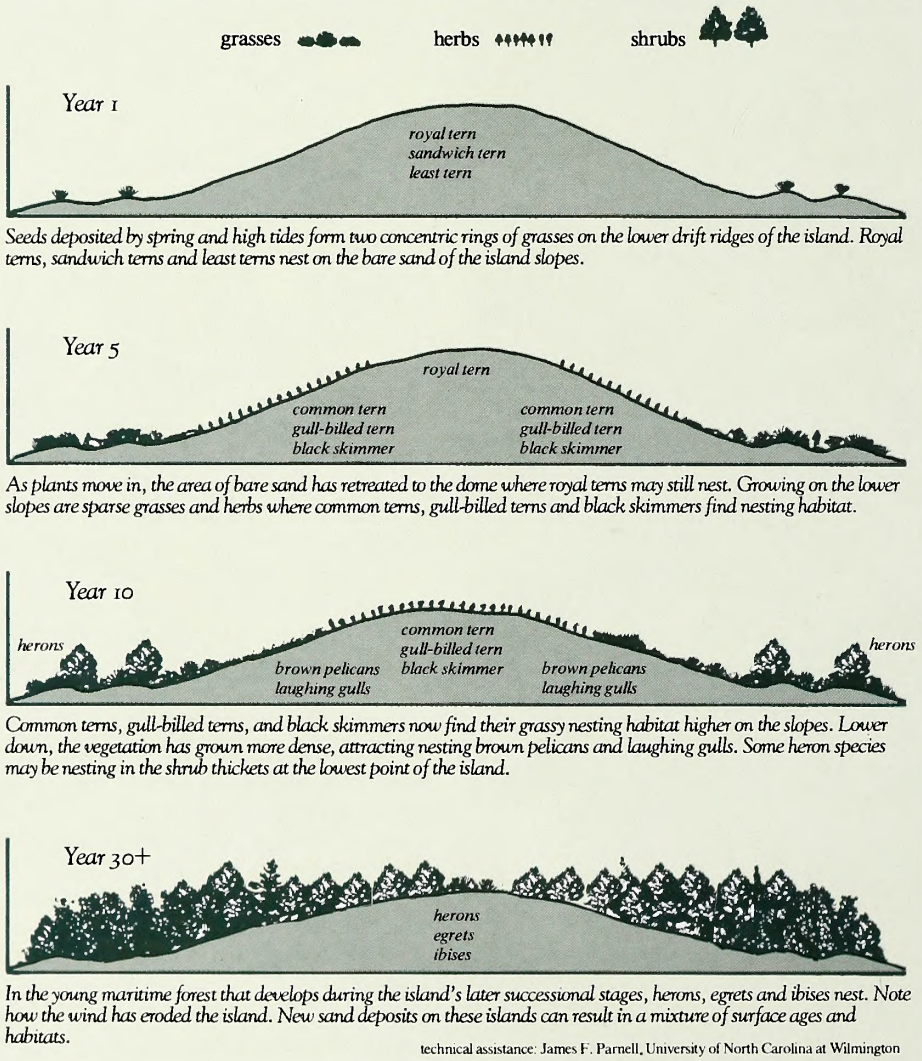
This lively scene is repeated yearly as the waterbirds congregate during the spring and summer months on islands and beaches throughout the coastal region of North Carolina. They are there to nest. They nest in loud, squawking colonies because they are colony-nesting or colonial waterbirds, birds that feed on fish and other aquatic

Thousands of nesting *royal terns lay their eggs on bare sand on a man-made island in the Cape Fear River. The raucous, teeming colony is typical of the nesting strategies adopted by 25 coastal bird species that find safety in numbers.*

Our Coastal Colony Nesters

An Island's Changing Habitat

Over time, islands made of dredged sand are invaded by plants in several stages of natural succession. Each stage may attract different species of nesting waterbirds.



Seeds deposited by spring and high tides form two concentric rings of grasses on the lower drift ridges of the island. Royal terns, sandwich terns and least terns nest on the bare sand of the island slopes.

As plants move in, the area of bare sand has retreated to the dome where royal terns may still nest. Growing on the lower slopes are sparse grasses and herbs where common terns, gull-billed terns and black skimmers find nesting habitat.

Common terns, gull-billed terns, and black skimmers now find their grassy nesting habitat higher on the slopes. Lower down, the vegetation has grown more dense, attracting nesting brown pelicans and laughing gulls. Some heron species may be nesting in the shrub thickets at the lowest point of the island.

In the young maritime forest that develops during the island's later successional stages, herons, egrets and ibises nest. Note how the wind has eroded the island. New sand deposits on these islands can result in a mixture of surface ages and habitats.

technical assistance: James F. Parnell, University of North Carolina at Wilmington

species and derive safety from numbers. What kind of numbers? It depends on the species. In a given colony, there may be only a few dozen nesting pairs of herons and egrets, but a few thousand pairs of gulls and terns may be there as well.

Twenty-five species exhibit colony-nesting behavior in North Carolina. Among the pelican-like birds are the anhinga, the double-crested cormorant and the brown pelican. The long-legged waders include six heron species (great blue, little blue, tri-colored, green-backed, black-crowned and yellow-crowned night herons), the great and snowy egrets, and the white glossy ibises. The colony-nesting shorebirds comprise three gulls (laughing gull, herring gull, and great black-backed gull), seven terns (gull-billed, Caspian, royal, sandwich, common, Forster's and least), and the black skimmer. Twenty-one of these species nest on barrier islands and estuarine islands, and the remaining four species nest primarily in the coastal swamps. Some of them prefer to lay their eggs on bare, windswept beaches; others like the safety of dense maritime forests; still others feel more protected in deep coastal swamp forests.

Over the years, the timeless nesting urge of these birds has changed as their habitat has diminished. Once most colonial waterbirds nested on beaches and natural islands. But because of heavy recreation and development, many species today have shifted to man-made islands — islands built or modified by dredging operations in estuaries and coastal rivers. These islands provide suitable nesting habitats for many species, although many of these habitats are temporary. Indeed, an island that begins as a pile of dredged sand will change over time as different plants become established. First, grasses will colonize the lower slopes of the island, moving up the slopes year by year. Other plants will start growing, creating denser patches of vegetation. Finally, a thick maritime forest will replace the earlier stages of vegetation. The entire process of succession may take 30 years, and each habitat stage attracts specific species of birds.

The change to island nesting has been fortunate in at least one respect. In most cases, islands provide the isolation that's necessary for successful breeding. Because the islands are normally developed in open water in a very short time, mammalian predators are absent. These islands have now become critical habitat for the birds and may, in fact, represent their last nesting havens in the state.

At first glance, the status of these birds is deceiving. If you visit an island where thousands of nesting waterbirds are gathered, you might get the impression that these birds are downright abundant. But the island may be only one of a few sites with nesting habitat. In addition, many of the preferred habitats are temporary and can change rapidly because of development, erosion and vegetative succession.

In fact, population levels of most colonial waterbirds in North Carolina today are declining. The snowy egret, little blue heron, tricolored heron, glossy ibis, and black skimmer have declined so much that they may be given "special concern" status under the North Carolina statutes on rare and endangered animals. Populations of the brown pelican, double-crested cormorant,

WILLIAM WALKER GOLDER

***A common tern** finds a convenient perch on a sign erected by Wildlife Commission biologists. About 30 islands serving as nesting grounds were posted in 1989. Discouraging human disturbance on these islands is only part of a multi-agency effort to protect vulnerable populations of the colony-nesters.*

great egret, black-crowned night heron, yellow-crowned night heron, white ibis, least tern, common tern, royal tern, Forster's tern, and sandwich tern are considered to be vulnerable.

To help these birds, the N.C. Wildlife Resources Commission's Nongame and Endangered Wildlife Program has undertaken a new management project based primarily on the research of Dr. James Parnell of the University of North Carolina at Wilmington. Although the Wildlife Commission will be the lead agency, a host of other agencies and organizations will also be involved, including the U.S. Army Corps of Engineers, National Audubon Society, National Park Service, U.S. Fish and Wildlife Service, National Marine Fisheries Service, N.C. Division of Marine Fisheries, N.C. Division of Coastal Management, and N. C. Division of Parks and Recreation. All of these agencies have an interest in the coastal environment and several have direct land-management responsibilities. All have agreed to cooperate in managing and protecting these birds.

The first step in the program is to protect nesting areas and nesting birds. Many nesting areas will be closed to entry since disturbance by people can have devastating effects in colonial waterbird nesting colonies. When adult birds are disturbed, they leave their nests unattended with eggs or chicks exposed to the elements. Chilling during cool, wet weather or overheating in the summer sun can kill developing embryos and small chicks. Larger chicks may be forced away from the nest and become entangled in vegetation, or they may even be killed by other birds in the colony whose territories they violate. Avian predators such as gulls and fish crows often take advantage of human disturbances to rob unattended nests. In addition, the eggs and chicks of

Our Coastal Colony Nesters

WILLIAM WALKER GOLDER

***Forced from their** natural nesting habitats along the beaches and barrier islands, many colony nesters moved to man-made islands like this one in the Cape Fear River. As it is colonized by different plants over time, the island offers a variety of temporary habitats to birds.*

ground nesters are highly camouflaged and may be inadvertently crushed under foot or run over by vehicles.

Other kinds of disturbance are even more lethal, not only to birds but to other wildlife as well. The coastal region today is exploding with people building houses, roads and marinas, development that disturbs nesting but also destroys habitat and pollutes water. Water pollution is a most insidious problem, resulting in slashed food supplies, poisoned birds and eggs that won't produce chicks. Garbage is a problem, too, especially plastics. Many birds are killed each year after becoming entangled in discarded monofilament fishing lines, nets and plastic packaging materials.

When all these facts are considered, it's obvious that our colonial waterbirds are in a precarious situation. To protect the birds from intrusion, the Wildlife Commission in 1989 posted approximately 30 islands that serve as nesting grounds for waterbirds. Other cooperating agencies have done the same on several beaches. Although these agencies hope for voluntary compliance, regulations are now being formulated that will make entry into some of the nesting areas during the nesting season a misdemeanor punishable by fines. These closures will be enforced by the Commission's Division of Enforcement.

The second step in the program will be managing nesting habitat. Each waterbird species is adapted to a particular nesting substrate and vegetative community. Terns, for example, won't lay their eggs anywhere except on the bare sand. Brown pelicans and

KEN TAYLOR

KEN TAYLOR

Like cormorants *and other birds, an anhinga (top left) spreads its wings to dry. Anhingas nest in inland ponds and lakes rather than on coastal islands. Brown pelicans (below) nest among densely growing plants on coastal islands.*

laughing gulls like denser plant cover, and herons and egrets require thickets of trees and shrubs for nest-building. The range of preferred nesting habitat for each species is very narrow and colonies will readily move to more suitable habitat from year to year.

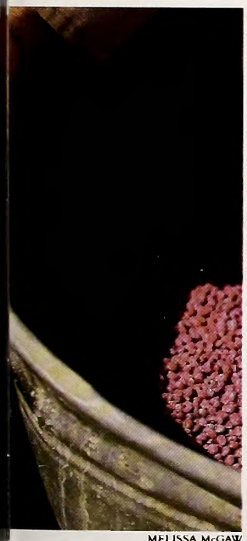
The object of habitat management is to provide enough of the right nesting habitat for each species in a well-distributed network throughout the coastal area. The key to managing habitat will be dumping dredged materials onto islands that are eroding or have become overly vegetated. This will permit new habitats—bare sand, for example—to develop that weren't present before. Such manipulation will help assure that preferred habitat is available to each species. In some instances, it will be necessary to control vegetation directly by mechanical means.

To locate colonies and decide how to manage the sites, Wildlife Commission biologists conducted aerial surveys of the entire coastal area last May. This annual activity will yield information that can be compared from year to year to identify areas that have become unsuitable for nesting. The habitat can then be assessed to find out why the birds abandoned it and steps can be taken to restore its attractiveness to nesting birds. The results of the surveys will be available to all parties of the cooperative agreement to aid them in managing their colonies or help in reviewing the environmental impacts of development.

North Carolina's Colonial Waterbird Project has great potential in conserving these important wildlife resources. Within the cooperative atmosphere, a number of accomplishments have already been realized. Perhaps the greatest has been making public agencies and private citizens aware of the value of these birds and the need to protect their habitats. The cooperative approach is unique and it can become a model for other states and for other wildlife species. ⊠

Lobbying for *wildlife has been one of the North Carolina Wildlife Federation's most important missions. As executive vice president, Dr. Michael Corcoran (above) heads the Federation's fight on environmental issues. Quail Unlimited's primary focus has been habitat preservation and improvement through such projects as planting seed for food plots (right).*

MELISSA McGAW



MELISSA McGAW

Sportsmen *for* Wildlife

Private groups are taking an increasingly active role in helping wildlife and its critical habitat.

by Vic Venters

Let's be honest. North Carolina has some great hunting and fishing, but our wildlife resources just don't stack up against those in some regions of the country. Our bass and trout don't grow as large as they do in some locales and our turkey populations are comparatively small. Our quail and rabbit populations have shrunk, and waterfowl no longer flock to our sounds and marshes in the numbers they once did.

This fragile resource is being strained further by habitat degradation. As North Carolina grows, more plowed fields are posted, more forests are cut and more streams are muddied by pollution and sedimentation.

To protect what's left, many concerned sportsmen have joined private, nonprofit conservation groups. They may not solve our environmental problems, but they at least give the sportsman a chance to contribute to an ecosystem we all take from.

The North Carolina chapters and councils of these groups rank at or near the top of their respective national organizations in fundraising or leadership roles. Their hard work and dedicated service may save a sporting heritage for our children to enjoy.

Here's a quick look at five of the diverse groups working to save North Carolina's wildlife and environment.

The North Carolina Wildlife Federation

The importance of this broad-based conservation group, formed in 1945 by a group of hunters and fishermen, cannot be underestimated. The Wildlife Federation's initial goals were the creation of an independent wildlife agency for the state and the sound conservation of the state's wildlife resources. In 1947, the first goal was fulfilled when the state's General Assembly formed the N.C. Wildlife Resources Commission. "After the Commission was formed, a lot of the guys in the Federation said we've done it, let's go home," explained Dr. Michael Corcoran, the executive vice-president of the Federation. "There was serious talk about disbanding it."

But even by the 1950s, environmental problems were beginning to affect sportsmen. The Federation persevered, and today it consists of over 40,000 members and more than 80 local wildlife clubs. The Federation is also affiliated with the National Wildlife Federation, one of the nation's largest conservation organizations.

A primary focus of the N.C. Wildlife Federation has been lobbying for wildlife-

oriented legislation. Because of the Federation's sportsman membership base, the organization has worked hard for laws dealing with traditional fish and game conservation. Yet, the Federation's efforts are increasingly focused on larger environmental issues, not just those that directly affect hunters and fishermen. To expand its legislative effectiveness, the Federation formed in 1987 a separate lobbying and political action arm, the Alliance For Conservation Action, a canvass with a diverse membership.

You don't have to look hard to see how effective the Federation and Alliance have been. Along with the efforts of the North Carolina Nature Conservancy and similar environmental groups, the Federation's intense lobbying and grass-roots letter-writing campaign helped bring critical political support for the creation of the Roanoke River National Wildlife Refuge, the designation of 200,000 acres of North Carolina's coastal waters as Outstanding Resource Waters, and the prevention of peat mining on the coast.

"It doesn't make a lot of sense to argue size and bag limits if there is no clean water or forested land left," said Corcoran of the Federation's expanded role.

The Federation is also fighting on the front lines of environmental education. The group serves on the North Carolina Council on Environmental Education, helps sponsor the "Fur-Fish-N' Game Rendezvous" educational camp for kids and wildlife demonstration farms, and has helped fund environmental education projects such as Project WILD and its correlation to the state's teaching curriculum.

The Federation also builds alliances between diverse conservation groups. For instance, the Federation worked closely last year with Trout Unlimited to reform sedimentation laws. It's also worked with the Sierra Club to analyze U.S. Forest Service management practices. "We are able to talk to the guy who fishes bass tournaments, and we can also talk to the person in the Sierra Club who doesn't," said Corcoran. "It's important for people to understand whether or not they hunt or fish that at the root we are dealing with the same issues."

Ducks Unlimited

The largest and oldest single-purpose sportsman's organization is Ducks Unlimited. Formed in 1937, Ducks Unlimited focuses its energies on the preservation of wetland habitat. Ducks Unlimited has particularly strong ties to North Carolina because it was in Currituck Sound back in the 1920s that DU founder Joseph Knapp first envisioned a national conservation organization geared to protecting wetlands.

Habitat improvement, *such as this stream project being carried out by Trout Unlimited volunteers, is only the most visible facet of a conservation group's work. Education and environmental lobbying form other crucial links in the chain to protect wildlife.*

Nationally, Ducks Unlimited today counts over 600,000 members, has 4,000 chapters and has completed over 5,000 projects encompassing 6 million acres in Canada, the United States and Mexico. The organization has managed to funnel an impressive 80 percent of its funds directly into habitat protection.

In North Carolina, DU has 120 chapters and 15,100 members and ranks first among state DU chapters in numerous fund-raising events. "North Carolina has been one of the leading states for at least 30 years and consistently ranks in the top 10 in all of the categories," said Don Manley, the field operations supervisor for the South Atlantic Flyway.

While the protection of Canadian breeding habitat remains paramount, DU has also increased protection of wintering waterfowl habitat in the United States.

In 1985, DU began its MARSH campaign — Matching Aid To Restore States' Habitat. MARSH provides funds to state wildlife agencies to preserve and enhance wetlands that are important wintering habitat. Since 1985, DU has contributed more than $300,000 to the state through the Wildlife Resources Commission. Already three MARSH sites have been created in the state, and another 15 are planned.

As the 1990s begin, DU finds itself playing a major role in the North American Waterfowl Management Plan, a $1.5 billion comprehensive international program designed to preserve the continent's remaining waterfowl habitat. With duck populations reeling from the destruction of unprotected habitat and from decade-long drought and agricultural practices, DU's mission to preserve waterfowl habitat remains as important today as it was in 1937.

Trout Unlimited

Last year, Trout Unlimited celebrated its 30th birthday at its national convention hosted in Asheville. It was also a birthday party for the North Carolina Council of Trout Unlimited because TU was born in

KATE DAVIES

the state 25 years ago. The national organization consists of over 60,000 individuals, and there are over 2,000 members and 15 chapters in the North Carolina Council.

Although North Carolina trout fishing will never match that of the American West, this hasn't slowed North Carolina TUers down — the state council has managed to lead the nation in the amount of money raised at banquets for the last four years and has six members on TU's national board of directors. Richard Mode, a national director from North Carolina, was elected president of the national organization this year.

TU's philosophy has been to protect the cold-water fisheries, in part through the creed of "catch and release" and in part through wild — as opposed to stocked — trout management.

In its early years, N.C. TU worked closely with the Wildlife Commission to develop a trout-management plan that addressed wild trout management. These days, wild trout programs are common; in 1964, they were not. Today, N.C. TU is again helping the Commission formulate a new trout-management plan that better addresses increased fishing pressure.

TU's mission, however, goes beyond encouraging sound trout management through regulations. It is actively involved in legislative lobbying for broader water-quality issues. TU has been at the forefront of the fight against acid rain and has worked to strengthen sedimentation laws — matters that affect the environment far away from the cool waters of a trout stream. TU's newest strategy focuses on protecting entire watersheds rather than just selected rivers or streams, said Rick Fayssoux, chairman of the North Carolina Council. TU has also helped build access areas for handicapped anglers on streams and rivers and lakes in North Carolina.

The National Wild Turkey Federation

Nationwide, the National Wild Turkey Federation has over 51,000 members in 200 chapters. The 2,200 members and 12 chapters of the North Carolina chapter of the National Wild Turkey Federation should be proud. Since its formation in 1973, the chapter has helped the Wildlife Commission bring the wild turkey population from 3,000 birds to between 15,000 and 20,000. And it's not finished yet.

"We're nowhere near carrying capacity of the land here in North Carolina," said Bill Williams, president of the North Carolina chapter of the Turkey Federation. "We've got at least 2 million acres in the state that have been identified as prime habitat where there are no turkeys. We can support at a minimum at least 50,000 turkeys on this habitat."

To restore the turkey populations, the Turkey Federation uses money from its "superfund" to help state agencies pay for the cost of relocating wild turkeys from locales where they are plentiful. Currently the North Carolina chapter has over $75,000 to pay for the transfers. Once birds are transferred to an area, and have had time to breed and establish a population, then the area can be opened for hunting.

While the full restoration of the turkey to North Carolina will remain the primary objective of the organization for years to come, the Turkey Federation also helps with hunter-education projects and improves habitat by reseeding old logging roads and closing access to some restocked areas.

Quail Unlimited

The advent of Quail Unlimited in 1981 in Augusta, Georgia, must have filled a niche, because in eight years, the organization has grown from ground level to 45,000 members and over 300 chapters nationwide. This kudzu-quick growth is also evident in North Carolina, where there are more than 4,000 members and 18 chapters.

Like Ducks Unlimited, QU puts its money where the birds are. "Our main concern is habitat creation and preservation," said Donnie Buckland, regional director for QU's mid-Atlantic states. "Our money is spent on both public and private lands. For instance, last year in North Carolina we planted 93 miles of food strips on public land and 614 miles on private land. Over 3,000 shrub lespedeza were planted and we carried out prescribed burning on 2,960 acres. We also planted 4,445 miles of sorghum seed for food." QU also funds research projects and contributes to state wildlife agencies for quail projects.

Although QU is best known for planting food plots, that activity is only part — not the whole — of QU's mission. "Quail need four things: nesting cover, brood cover, winter cover and food and water," Buckland explained. "We try to get landowners to provide for the whole concept, not just planting some annual food crops."

This holistic concept promises to help not just quail, but many wildlife species, Buckland stressed. "Even though we are called Quail Unlimited, our habitat work benefits other upland game species such as rabbits, as well as nongame species. It will also help keep the hunting tradition alive.

Significant Others

This short list of sportsmen's conservation groups is by no means complete. Other worthy groups such as the N.C. Bass Chapter Federation, Atlantic Coast Conservation Association, N.C. Coon Hunters Association, N.C. Field Trial Association, Ruffed Grouse Society, N.C. Bowhunters Association, Hyde County Waterfowl Committee, Lake Norman Striper Club, and various muskie clubs all contribute valuable funds and time to help preserve our wildlife resources. In addition, there are dozens of important environmental groups such as the The Nature Conservancy, Audubon Society, and Conservation Council of North Carolina working to preserve the environment for all of our state's citizens.

It's a fact that today's wilderness is no longer really wild, and the wildlife we have exists largely through our stewardship. Our hunting and fishing tradition allows sportsmen a chance to catch a glimpse of the past — to steal a moment, however short, of the earth's bounty as it used to be. All of the hard work and long hours spent toward "putting something back" are just a small way in which sportsmen say "Thanks, we'd like to visit again." ⊠

Cold-Water Crappies

Most freshwater fish get lockjaw during mid-winter, but crappies are always ready to bite —if you can find them.

written and photographed by Gene Hester

The rod tip danced on the water, vibrating up and down and making little dimples in the calm surface. Seven feet below the rod tip, a 1/16-ounce yellow crappie jig wiggled and bounced, its maribou tail undulating in a swimming motion.

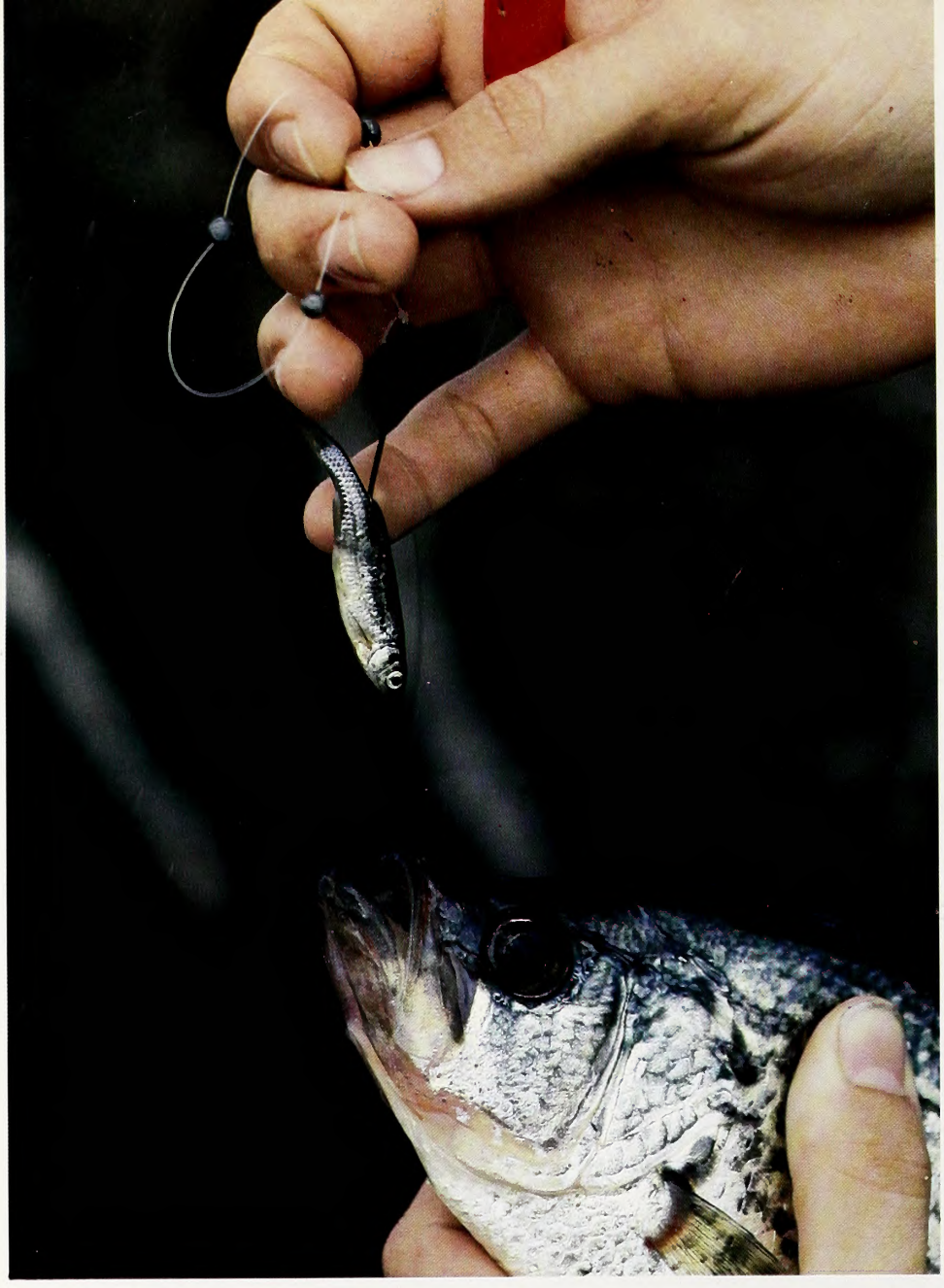
Suddenly the rod tip dipped beneath the surface and instinctively I set the hook. The fish reacted by swimming deeper, then moving away from the boat. As it turned its flat body sideways, the rod bowed and line stripped from the reel.

By being patient and maintaining steady pressure, I was able to bring the fish to the surface, grab it by the lower jaw and lift it into the boat. The beautiful crappie glistened in the sunlight. With its fins flared, it was magnificent.

More important, perhaps, I knew there were sure to be more where that one came from because crappies are schooling fish. Locate a school of them, and you usually can catch many in the same spot. Sometimes that spot may be very small, with literally dozens of fish clustered in an area not much bigger than a washtub. Finding the right location and the right depth can be a major challenge, but the reward is a chance to catch dozens of hungry crappies.

Crappies are really year-round fish and can even be caught right now in January. They don't seem to become as lethargic as bass and bluegills do in winter, so they're ready to bite at any time. Indeed, some fishermen farther north even catch them through the ice. In North Carolina, in the

***Bill Hinnant** shows off a handsome black crappie he caught on a tiny jig in a millpond on a brisk February day. Although the weather is often cold this time of year, many days may be sunny and relatively comfortable if you dress appropriately. The author carries several pairs of cotton gloves to help keep his hands warm and dry when handling live bait or fish. When his gloves get wet, he changes to a dry pair.*



warmer months, people catch crappies at night under lights. Most fishermen, however, catch them during the day from a boat in fairly large lakes. Crappies don't like a river current, and when you find them in rivers, they'll be in quiet eddies and pools.

In lakes, crappies move around in different seasons. For this reason, the locations and methods you use need to match the seasons and moods of these fish. In winter crappies school in open water. If the weather is mild, they may be only a few feet deep in the middle of the lake. When the water turns very cold, however, they often congregate in deeper water, where they may school just above the lake bottom.

In one millpond I have found them 7 feet deep, only a foot from the bottom in the deepest part. They move around so much that I don't find them in exactly the same spot each time I go. Still, they are usually within 100 feet of where I found them the previous time. In large lakes, they are far more likely to be found in deeper water, certainly deeper than 7 feet, and some anglers catch them down to 20- to 25-foot depths in mid-winter in large reservoirs.

Though crappies can be caught on many types of natural baits and artificial lures, by far the best are small live minnows or small lead-head jigs with tails of feathers or plastic. Sometimes, I find that minnows work best, and at other times jigs are better. Some of the difference seems to be seasonal — minnows are best in the spring; jigs in winter. It's not always that clear-cut. Even in winter, I have found that minnows will work better some days and jigs on other days. An important thing to remember is that you can catch them either way, so you can't go wrong if you've got both jigs and minnows with you.

In addition to being effective in winter, jigs have another advantage in cold weather. You can keep your hands a lot drier fishing with jigs than with minnows. You simply don't have to handle wet, wiggling minnows, and that's important when the air and water are only a few degrees above freezing. Even so, I like to wear cotton gloves and carry several extra pairs. When fishing with a jig, I handle the fish with the gloves on and change to a fresh pair when they get wet.

One of the best ways to locate crappies in open water is to drift in a small boat with

***Minnows this** size (top) are just right for crappies, and live bait is hard to beat on many days. Even so, small jigs will sometimes outfish live minnows, so it pays to have both and know how to fish them.*

several lines trolling over the side or behind the boat. I like to pick a sunny day with a very slight breeze. A breeze that is almost imperceptible is ideal because you can troll across the lake at a very slow speed while drifting.

When fishing with minnows, I suggest rigging your lines with moderately large corks and several split shot. You can use small corks with only one or two split shot, but in a breeze they will troll too close to the surface. With a larger cork and four or five split shot, the minnow will stay nearer the desired depth, yet the cork will not sink when you stop. When trolling in open water, it's a good idea to troll several lines at the same time. Start out with lures set at different depths until you begin catching fish with one of them. Then you might want to set the others at the same depth. It is not uncommon to see fishermen trolling three or four poles from a boat. On one lake we often see a fisherman with about six poles tucked under his boat seat and radiating out in all directions. He gives the appearance of a multilegged water strider and we have nicknamed him "spiderman."

If you find crappies in open water, it can be hard to remember the location since the boat is drifting and there may be no natural markers such as stumps or trees. One fisherman I know carries a plastic bottle tied to a cord and a rock weight in his boat. When he catches one of the open-water crappies, he slips the weight overboard, letting the bottle serve as a temporary marker.

In the early spring, usually March and April, crappies move into relatively shallow water to spawn. Their spawning activities—sweeping saucer-shaped beds in the lake bottom and laying eggs—are similar to a bluegill's, but crappies spawn earlier in the spring and usually in a little deeper water. As spawning time approaches, it is a good idea to work the shoreline and underwater points and bars, concentrating mostly in water 2 to 6 feet deep. When you catch a fish it is usually easy to tell if you have found a bedding area. At spawning time the males will be dark, almost black, with a sooty appearance. The females, while lighter in color, will often have distended abdomens containing thousands of eggs. Dozens, even hundreds, of crappies may congregate in a spawning area.

At other seasons of the year, crappies will usually be in other, deeper parts of the lake. In summer I find them in open water, often around structures such as weed beds or underwater brushpiles. Sometimes they will be located in one very specific place, such as between two stumps. Though you may be able to catch a couple of dozen from that one spot, you may not find them 6 feet away in any direction. That's one of the things that makes crappie fishing so challenging. It is difficult to find their favorite spots, but if you do, you're likely to catch a lot of them.

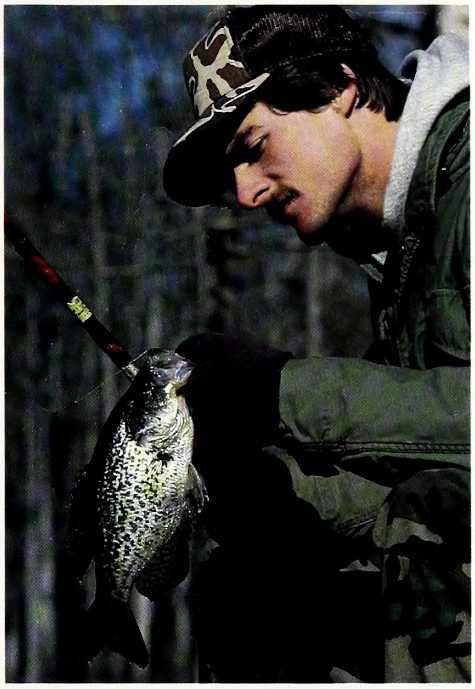
Fishermen in large lakes sometimes use electronic fish locators to find crappies. I have used one several times, and it works great for identifying underwater topography. Still, I rarely actually see the fish on my screen. I think this is because the transmitted cone is so narrow that in shallow lakes it covers an area only a few inches in diameter. Fish finders are a big help in locating drop-offs, creek channels, underwater ridges and brushpiles, and identifying these structures often gives me the clues I need to find the fish because they are usually around them.

Dedicated crappie fishermen have another way to improve their chances of finding schools of crappies. Knowing that crappies are attracted to underwater structures such as brushpiles, some fishermen create these formations by wiring cement blocks to discarded Christmas trees and sinking them where they can be located later. I find that sinking several trees in a group in water about 6 feet deep works well. I tie a weight to the side of each tree so it will lie on its side. That way the branches will be 3 to 6 feet below the surface. Submerged in this way, they attract fish but won't interfere with boating or other types of fishing.

One rule of thumb when fishing for crappies with minnows is to use small minnows. A minnow more than 2 inches long is too big for most crappies. When fishing in winter you may be able to buy small minnows at your fishing supply store, but you can also collect your own. Usually minnows are easy to seine from small creeks. One of my most reliable sources is a small creek at the head of a farm pond, where I can collect dozens of minnows with a few passes of my minnow seine. These 1½-inch minnows work great.

As for jigs, most fishermen use jigs weighing from 1/8 ounce to 1/64 ounce. Jigs have lead heads and come with feather or plastic tails in a great variety of shapes and colors and all will catch fish. The ones I have found most effective, however, are 1/16 ounce (these weigh enough to sink to the desired depth quickly and have a relatively large hook). The colors I have found to work well are solid yellow, chartreuse head and body with a white tail, and red head with a white body and tail. Of all the jigs I have tried, my favorite is an all-yellow Betts Glitter Grub. It has a lead head, plastic body, and maribou-feather tail.

You can catch crappies by casting a jig and slowly reeling it back while working the rod tip to create lure action. That method can be especially useful to cover a lot of water while searching for a school of fish. After you have found the fish, change to a vertical jigging technique. Fish straight down with your jig directly below the rod tip at the desired depth and vibrate the rod tip to create lure action. Practice this with the lure only a few inches deep so you can watch it and learn which rod motions create the most lifelike lure action. Rapid but very slight movement usually works best.



***Unlike many** freshwater fish, crappies bite even when the water is cold. You can't distinguish black crappies from white crappies by their color, but counting their dorsal fin spines will help you identify them. White crappies have five or six spines; black crappies have seven or eight.*

When you locate a school of crappies, you will usually catch only crappies. Sometimes, though, you may catch other species, the most common being the flier, a closely related species that looks so much like a crappie that many fishermen do not recognize the difference. Sometimes, too, you may catch chain pickerel, largemouth bass, yellow perch, white bass or bluegills.

Crappies caught in cold water are at their peak for flavor, texture and freshness. They're great when fried in a light batter and served with hush puppies, slaw and french fries.

When those bright cool days come along in winter, it's time to go, and you can be sure that schools of fat crappies are there, hungry and ready. ⊠

Some Flatheads In For A Shock

Local Law Allows Electrofishing For Cape Fear Cats

Written and Edited by Vic Venters

Say you're a flathead catfish in the Cape Fear River. Topping out at close to 60 pounds, you ain't got many enemies — or friends for that matter. You've eaten 'em all.

Then one day, from up above, down floats a telephone line.

"Mr. Flathead," the wire sings, "you've got a collect phone call from that fishermen in the boat up above. Will you accept?"

Actually, flatheads won't have *any* choice, and more of them are going to find themselves the main course for dinner a lot more often in Sampson, Bladen and Pender counties because of a local law which now allows fishermen to electrofish in parts of the Cape Fear River and its tributaries. Electrofishing for catfish has been a traditional — though illegal — method for taking the big river cats for decades.

The law, sponsored locally this summer, allows fishermen to use crank telephone generators to electrofish in the South River from Ennis Bridge at Secondary Road 1007 to its junction with the Black River and in the Black River from Clear Run Bridge at N.C. 411 to its junction with the Cape Fear River.

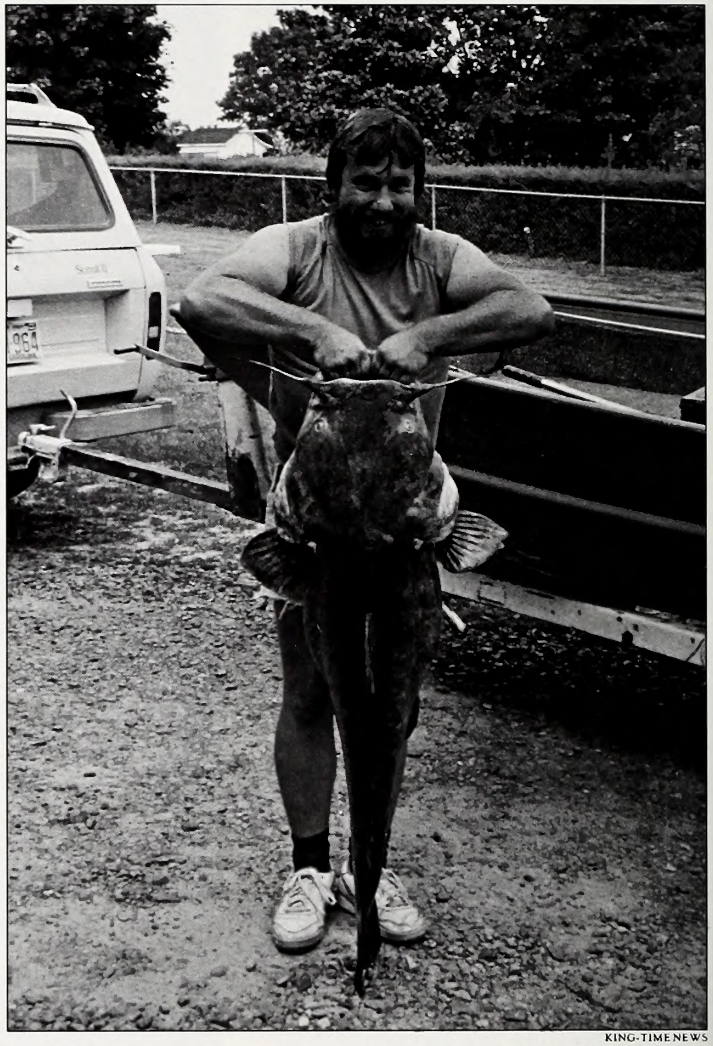
Typically, two wires are placed in the deep holes and dropoffs in the river that catfish favor. The fisherman then turns an old-time crank telephone generator and the resulting low voltage electric current stuns catfish, sending them floating to the top of the water. Only catfish are susceptible to this low voltage jolt, so sport fish like bass and sunfish are not affected.

While the Wildlife Resources Commission didn't sponsor this law, it did not oppose it, said Fred Harris, chief of the Commission's Division of Boating and Inland Fisheries. Electrofishing will be limited to those area with large populations of flatheads and a special device license will be required to "telephone" these cats.

Flatheads, introduced from the Mississippi River drainage years ago, are not popular with many area fishermen who complain that the fish — which can exceed 60 pounds — are decimating the river's sunfish populations.

"We've had a lot of reports from fishermen that the sunfish catch has dropped off," Harris said. "Our studies do not indicate flatheads are depleting sunfish populations. They prefer to eat other catfish, especially bullhead catfish." A Commission-sponsored study last summer showed stable sunfish populations. However, studies have shown that flatheads have reduced, though not eliminated, bullhead catfish populations.

Currently, only a few fishermen take the big flatheads by traditional hook-and-line methods, Harris said. "The intent of the law was to allow a greater utilization of the flathead," he said. "They are not a big threat to sunfish populations but there are benefits in not letting flathead numbers get out of hand."



KING-TIME NEWS

Catfish Currents: *A new law permits anglers in Sampson, Bladen and Pender counties to electrofish for catfish in parts of the Cape Fear River. Although this 62-pound flathead catfish was taken by hook and line, few anglers fish for the giant river cats by traditional methods. The new law should allow increased harvests.*

Calendar Of Events

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before travelling to an event. Listings for the calendar should be sent at least four months in advance.

January 6-31
An international wildlife display and program at the Haywood County Library in Waynesville will feature educational exhibits, photography shows and reading materials on a variety of international wildlife topics.

$100 Million Industry Possible

Aquaculturists Harvest First Crop Of Pond-Raised Hybrids

Until the 1970s, North Carolina's Albemarle Sound and Roanoke River were one of the nation's best striped bass fisheries. However, water pollution, habitat alteration and overfishing have combined to lead to extensive and severe population declines.

While the jury is still out on the fate of the wild stocks of stripers, North Carolina may return to striped bass glory days, at least in the form of pond-raised striped bass hybrids. If successful, hybrid production could eventually become a $100 million industry in the state.

In a project co-sponsored by the National Coastal Research Institute (NCRI) and UNC's Sea Grant College Program at N.C. State University, aquaculturists Lee and Harvey Brothers harvested the nation's first successful crop of striped bass hybrids from ponds last spring. The Brothers' Beaufort County operation raised over 70,000 pounds of hybrids, and the fish—a cross between the white bass and a striped bass—fetched a very healthy market price of $2.25 to $3.35 per pound. The hybrids are excellent table fare and are popular in restaurants.

The successful harvest was the result of work begun in 1981 by Sea Grant and NCRI. Researchers at Sea Grant first proved they could produce a 1.5-pound marketable fish in two growing seasons. They have since refined growing techniques and an NCRI grant was applied to the Brothers' operation to help produce more information on pond culture for hybrids.

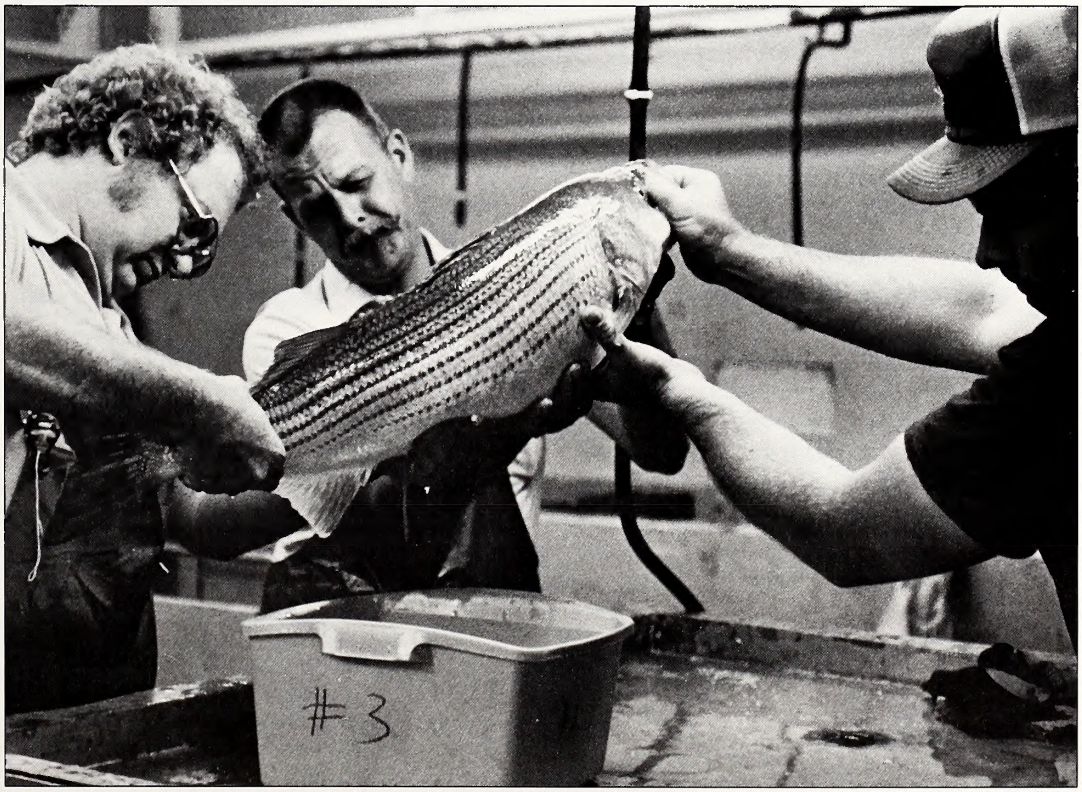
While the hybrids appear well-suited for pond aquaculture, growth in the industry is currently hampered by the lack of a commercial supply of eggs and fingerlings. Wild female striped bass that are old enough to spawn are in short supply because of population declines and regulations that prevent their harvest. However, Sea Grant researchers feel a breakthrough in the egg supply problem may be imminent.

The researchers have semi-domesticated about 50 wild-stock female striped bass that had spawned the previous year. These fish are now eating in captivity. Previously, although only a few fish were needed to get the necessary number of eggs, the female stripers that were stripped of eggs were usually killed in the process. "If we spawn these fish this spring, that will be a major improvement in our ability to produce fingerlings," said Dr. Ronald Hodson of Sea Grant.

Sea Grant is also attempting to produce fully domesticated spawners. "We have young brood stock that were raised from eggs at the lab," Hodson explained. "In another two years, we will have pure-line striped bass that are old enough to spawn."

While there have been previous attempts to raise striped bass from eggs to sexual maturity, the resulting brood fish did not produce fertile eggs. However, Hodson feels that improved laboratory conditions will lead to successful breeders. "We're pretty excited about this and I think we've got a pretty good chance of success."

Once the egg supply problem is solved, North Carolina has an excellent chance of leading the nation in pond-raised striped bass hybrids. "I think North Carolina is very close to being perfect for this fish," he said, adding that the state's temperate weather, excellent water quality and suitable land provide all the necessary components for hybrid aquaculture. "The state could end up being the number one spot in terms of ideal conditions for raising this fish. There is no question that this will be the next fish species to be raised in major quantities. There is high demand for the fish, it's excellent eating, and we understand its life cycle and have that under control to a certain extent."



N.C. WILDLIFE RESOURCES COMMISSION

Stripping A Striper: *Aquaculture for striped bass/white bass hybrids may grow to become a $100 million industry in the state if biologists can perfect a method for obtaining a sufficient supply of striped bass eggs. Currently, researchers at the Sea Grant program at N.C. State University are advancing techniques for keeping female stripers alive after they are stripped of eggs.*

Fish Hogs Catch Fish, Throw Them Away

Reader Urges Limits On Salt-water Sportfishing

Dear Editors:

I found the article "Fishing's Future in the Salt" by Joel Arrington very interesting. Being a bass, trout, and now, Chesapeake Bay fisherman, as well as an oceanography major in college, I was intrigued by the concept of managing the salt water resources, but couldn't really relate to the issue. I mean, the ocean is a pretty big place, you know!

However, this fall, I accompanied my fishing buddies to Manteo for a Saturday offshore charter. Three of us landed three 60-pound tuna. It was great!

I was not prepared, however, for the carnage I witnessed back at the dock. We fished out of Pirates Cove and the fleet returned there at about 5 p.m. We had been told our fish would be cleaned at the dock. Our fish were eventually cleaned, along with 30 to 40 large trash cans stuffed full of fish from other boats. All of a sudden, Mr. Arrington's article hit home. No longer was the issue of salt water management an abstract concept.

Please get the bureaucracy moving toward adopting some reasonable limits on our salt water species. Please do something about the boat that pulled up beside us with over 450 pounds of dolphin that the four "sportsmen" on it did not want to take home, much less pay to get cleaned. I almost got punched out suggesting that if they had not been game hogs, they would not have had the problem. While we were waiting for our catch to be cleaned, we heard a lot of talk about 10-fish limits which were supposed to be enforced voluntarily by the charter captains. The limits weren't being enforced at all, and anyone who thinks they were is nuts!

Strong positive action needs to be taken to get this slaughter under control. Relying on the sea for a living hardly makes a charter captain an expert on conserving the resource upon which he depends. Relying on the commercial guys to help set creel limits is like relying on the truck drivers of the world to handle traffic regulations.

I really enjoyed my trip offshore, and I want to go again. Help make sure there will be some fish to catch out there next time. Please get to work on getting some limits in place.

James C. Cox Jr.
Waldorf, Maryland

As commercial and recreational overfishing have depleted certain saltwater fish, the issue of limits and catch quotas for saltwater gamefish is sure to become important in the coming years. Controversial though it may be, action will be needed to preserve enough fishery stocks for both commercial and recreational fishing.

The North Carolina Wildlife Resources Commission regulates only freshwater and inland coastal fisheries. For saltwater policies, you may wish to write the N.C. Division of Marine Fisheries, P.O. Box 769, Morehead City, N.C. 28557.

Cast Us A Line...

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit any correspondence. Please send to Letters Dept., *Wildlife In North Carolina*, 512 N. Salisbury St., Raleigh, N.C., 27604-1188.

Field Notes

Season openings or closings this month:

Eastern gun deer season	Closes Jan. 1
Central gun deer season	Closes Jan. 1
Western bear season	See *Regulations Digest*
Wild boar	Closes Jan. 1
Gray squirrel	Closes Jan. 31
Rabbit	Closes Feb. 28
Bobwhite quail	Closes Feb. 28
Ruffed grouse	Closes Feb. 28
Western raccoon and opossum	Closes Jan. 31
Eastern raccoon and opossum	Closes Feb. 28
Mourning doves	Jan. 13
Snipe	Closes Feb. 28
Woodcock	Closes Jan. 1
Ducks, mergansers and coots	Closes Jan. 6
Snow and blue geese	Closes Jan. 31
Brant	Closes Jan. 20
Swan (by permit only)	Closes Jan. 31

Information on bag limits, either-sex hunts and other regulations may be found in the 1989-90 *North Carolina Inland Fishing, Hunting and Trapping Regulations Digest.*

First Colony Lands Will Be Protected

Developers, Japanese Thwarted In Peat-Mining Proposal

Proposals to mine peat in northeastern North Carolina for use in power plants have been smoldering off and on since the early 1980s. However, despite recent attempts by a Japanese company to begin peat mining, a settlement reached in a lawsuit this summer appears to have doused any chances for large-scale peat mining operations in the state. Because areas that contain peat deposits are wetlands and provide priceless wildlife habitat, environmentalists are viewing this settlement as a major victory.

The case dates back to 1985, when a Chicago developer filed an application with the state to mine peat from White Tail Farms, a 7,500-acre tract near Lake Mattamuskeet. In response, the Southern Environmental Law Center, on behalf of the N.C. Coastal Federation, N.C. Sierra Club, the N.C. Wildlife Federation and the N.C. Fisheries Association, filed suit to block the mining in 1985.

This summer, the settlement of the suit included an agreement by the U.S. Army Corps of Engineers to void its earlier decision that the White Tail tract was not a wetland. Previously, the Corps had ruled the farm was not a wetland, even though the tract had been illegally ditched and drained. The EPA will now classify the property and environmentalists are confident that much of the tract will be reclassified as wetlands. The settlement also held that the private parties involved would abandon all claims to peat mining on the tract.

The significance of this case quickly became apparent this summer when the Japanese company Nissho Iwai American Corporation outbid the Virginia-based Conservation Fund in a bankruptcy sale of the First Colony Farms land, a 104,000-acre tract in Dare, Tyrrell and Washington Counties. The Japanese company and Westinghouse Electric were considering a proposal to mine peat and build a power plant on the environmentally sensitive land.

The mining would certainly have destroyed wildlife. Armed with the White Tail Farms decision, environmental groups began behind-the-scenes negotiations with the Japanese who did not oppose the Conservation Fund's successful $8.8 million counter-bid for the First Colony tract.

"Those two decision have put into a preservation state a large part of the land with peat deposits on it," said Derb Carter, an attorney with the Southern Environmental Law Center. "Peat mining on the scale as it was once contemplated should no longer be possible."

KEN TAYLOR

Passing Up The Peat: *Two recent cases this summer appear to have put a lid on large-scale peat-mining proposals in northeastern North Carolina. Environmentalists are hailing the outcomes because of the wildlife habitat destruction that goes hand-in-hand with peat mining.*

For Habitat, Erosion Control Work

Commission Technicians Get Award

The U.S. Forest Service recently presented two Wildlife Resources Commission technicians awards for habitat improvement and erosion-control work performed on Forest Service lands in the western region of the state. Technicians Don Wilson and Joe McFee were presented plaques for work done on the Toecane Ranger District by Doug Francis, supervisory technician for the Forest Service, at the quarterly wildlife coordination meeting between the Forest Service and the Wildlife Commission.

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Status on October 31, 1989

	Numbers Sold	Revenue Received
Lifetime Sportsman's License	48,043	$17,369,631.34
Lifetime Hunting License	566	154,431.21
Lifetime Fishing License	3,713	819,150.96
Lifetime Subscriptions to Wildlife in N.C.	1,747	238,025.49
Contributions	—	159,352.40
Fund Total	54,069	18,740,591.40
Total Interest Earned	$4,881.138.36	

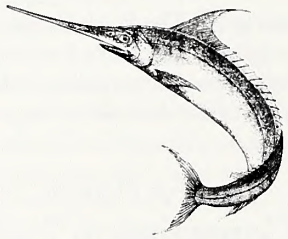
Record Blue Marlin Taken

DU Tournament Helps Ducks, Fisheries

Both blue marlin and blue wing teal will benefit from North Carolina Ducks Unlimited's first annual "Band The Billfish" tournament held last August.

In the two-day DU tournament, participants tagged five blue marlin, 11 white marlin, and four sailfish. These numbers represent 54 percent, 15 percent and 11 percent respectively of the same number of billfish tagged in these same waters during all of 1988. Banding data from recaptured fish provides the National Marine Fisheries Service with information needed for fisheries management.

The tournament also raised over $39,000 for DU wetland projects. The fishing highlight of the event came when a 1,002-pound blue marlin was landed. The 15-foot leviathan set a new Atlantic Beach/Morehead City record and is only the 19th blue marlin to be landed that weighs over 1,000 pounds.



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Colony-Nesting Waterbirds

Purchase this limited edition art print of "Colony-Nesting Waterbirds." To order, see page 33. For more information about colony-nesting waterbirds and the nongame program, read the article on page 14.

Making The Rounds

Few manmade barriers are a match for the clever and agile raccoon, and certainly no rail fence would keep this burly raconteur from making his rounds.

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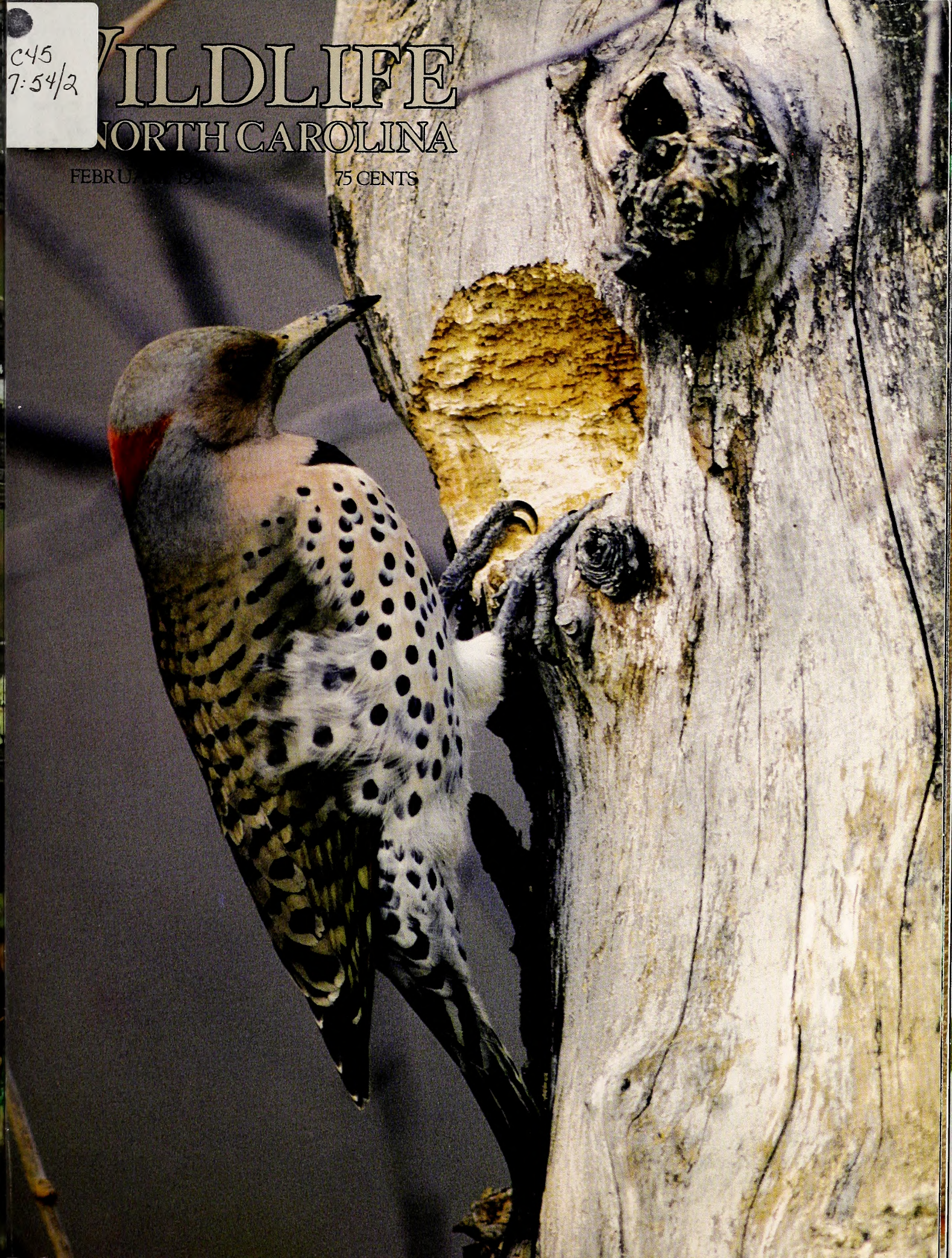
WILDLIFE IN NORTH CAROLINA

FEBRUARY 1990

75 CENTS

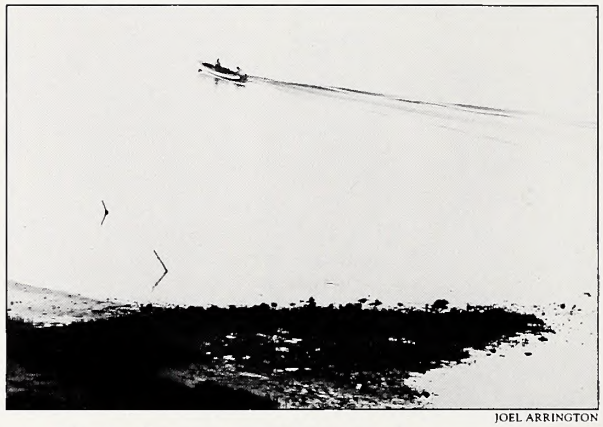


Helping Us Chart The Course

by Jim Dean

What sort of person subscribes to *Wildlife In North Carolina*, and why? How do you spend your spare time, and what are your main interests and concerns? Do you like the articles and photographs we publish, or are we overlooking subjects you might like better? Do your kids use it in school? We've wondered about these and other questions for a long time, and heretofore, most of what we've known has been guesswork.

With the price of the magazine set to rise from $5 a year to $7.50 per year with this month's issue, we decided it was a good time to conduct a readership survey to get better acquainted with you. Of course, with 81,000 subscribers, we couldn't sit down with everyone and chew the fat so we got The Center for Urban Affairs and Community Services at North Carolina State University to conduct the survey for us. Using the latest techniques, the surveyors contacted a random sampling of subscribers by telephone and asked a series of questions. The first thing we learned is that you're a patient and agreeable bunch of folks who don't mind spending a few minutes to help us. Of those contacted, 606 readers—over 83 percent—were happy to answer the questions. We appreciate that kind of support, and hope your roast didn't burn or your bathwater get cold while you were on the phone.



JOEL ARRINGTON

So, what did you tell us about yourselves? First, you are well-educated (93 percent graduated from high school, and over 45 percent graduated from college or have advanced degrees). Your favorite outdoor hobbies by a wide margin are fishing (34.7 percent) and hunting (21.3 percent), yet despite all the time you've spent fooling around outdoors, you've found time to make a pretty good living (71 percent report a gross income of over $30,000). More than 36 percent of you live in rural areas, but the rest are scattered pretty evenly throughout towns and cities. Only 30.5 percent of you have children under 18 living at home, but this is probably because a fairly substantial number of you are in your late 30s or early 40s, or recently retired.

By far the majority of you (26 percent) first learned about *Wildlife In North Carolina* by word of mouth, and over 37 percent have been subscribing for more than a dozen years. While 97 percent of you read the magazine for entertainment and relaxation, 62 percent consider it an educational tool.

The issues of greatest concern to you reflect a good understanding of some of the environmental problems facing the state. Your number one concern, by a significant margin, is statewide water quality, followed by pollution and general environmental protection. Coastal land and water quality (beaches, sounds) rank third, followed by wildlife conservation and protection, acid rain and loss of wildlife habitat.

Having told us your favorite sport is fishing, you also noted that your favorite fishing subject in the magazine is salt water fishing, followed by freshwater bass fishing, general freshwater fishing, mountain trout fishing and articles on various fishing techniques. Your favorite hunting subjects, in order, are deer hunting, quail hunting, rabbit hunting, dove hunting and duck hunting.

What subjects would you like for us to cover more often? You wanted more coverage of endangered and threatened species, followed by research to improve wildlife populations. You also wanted more articles on natural areas, threats to our environment and North Carolina nostalgia and history. We've always gotten good response from articles about nature trails and parks in the state, bird watching and wild flowers, and your survey answers ranked these high in interest, indicating that you'd like to see even more coverage of these subjects.

One conclusion is unmistakable. Even though the majority of you are fishermen and hunters, your interests are very broad, and your greatest concern is the health of our environment. That's not surprising if you consider that sportsmen have always been at the forefront of environmentalists because they see what's happening firsthand.

What you've told us through the survey should help us produce a more interesting and entertaining magazine. That's important to us as the official publication of the North Carolina Wildlife Resources Commission because education—along with regulation, management, research and protection of wildlife species and fish found in inland waters—is a key part of this state agency's role.

If the magazine isn't entertaining, you won't read it. And if you don't read it, you won't learn anything. And if you don't learn anything....well, you get the picture. Thanks for helping us learn something.

February 1990
Volume 54, Number 2

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Remember that pickled frog you dissected in school? Chances are it came from Carolina Biological Supply where scientific educational products include everything from maggots and tarantulas to kits that teach genetic engineering. Almost everything, that is, except puppy dog tails.

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DEPARTMENTS

Our Natural Heritage *by Jim Dean*

Nature's Ways *by Lawrence S. Earley*

Back Of The Book *by Vic Venters*

Cover *If this flicker's feet weren't able to grasp bark firmly, eating and nest building would be impossible. For more on the various adaptations of birds' feet, check out Nature's Ways. Photography by Steve Maslowski.*

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The talons of *hawks and owls make walking difficult, but they are perfect physical adaptations for birds of prey. Hawks have three toes to the front, one to the rear; owls have two toes to the front, two to the rear.*

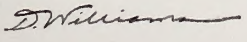
Water birds *have developed a variety of foot adaptations. Egrets have long legs and widespread toes that help distribute their weight as they wade over mud flats. Ducks and other swimming waterfowl have developed webbed toes that propel them through the water. The toes of grebes and coots have wide flaps of skin that push against the water.*

The crow, *like most birds, has three toes to the front, one to the rear. When birds squat on their night-time perches, tendons running to the ends of the toes tighten and pull the toes around the tree limb. That's why sleeping birds don't fall off their perches.*

Birds and Their Feet

written by Lawrence S. Earley / illustrated by David Williams

***A woodpecker has** two toes to the front and two to the rear, an adaptation tied to its life as a climbing bird. This arrangement helps the woodpecker maintain its perch even when it climbs underneath a tree limb.*



At first glance, the barred owl and the red-shouldered hawk have much in common. Both are about the same size, although the owl tends to be slightly larger. Both are birds of prey, taking rodents and other ground creatures which they dismember with their wickedly hooked bills. Both live in bottomlands and other wet woodland situations, although the hawk hunts by day, the owl by night.

If we focus on both birds' feet, we see more similarities—and one important difference. The legs of both birds are covered with scales all the way to their feet, a legacy of their five-toed dinosaur ancestors, and both have four toes with long, sharp, curved talons to grip their prey. Yet if you look closely, you'll see that the arrangement of their toes is quite different. The hawk has three toes pointing to the front, the fourth to the rear; the owl has two toes pointing to the front, two to the rear.

Despite their similarities, birds differ markedly in the structure of their feet. Each bird species, like each wildlife species, is adapted to its environment both physically (color, size, wing shape, length of bill etc.) and behaviorally (its instinctual reactions). These adaptations give each species an advantage in exploiting its environment.

Bird feet offer some of the most fascinating illustrations of the different ways animals adapt to their environments. Feet come in all shapes, sizes and colors. The hawk's three-in-front, one-in-the-rear toe arrangement is the most common plan in the bird kingdom. All perching birds, or passerines, for example, have this arrangement—these are the common songbirds of our backyards as well as warblers and other woods-loving birds. It's an adaptation suited to arboreal, or tree-loving, species, enabling them to hold fast to their perches.

The two-in-the-front, two-in-the-rear toe arrangement of the barred owl, on the other hand, is an adaptation developed by climbing birds such as woodpeckers, parrots and cuckoos. The woodpecker can climb up and down a tree and even along the undersides of a limb, yet propped by its tail (another physical adaptation) and supported by claws that "point almost to the four points of the compass," as one writer has described them, it is as secure as a perching bird.

There are a lot of other interesting foot adaptations. Look at the ways that water birds have evolved different kinds of feet to help them survive in or around water. Herons and egrets have very long toes to give them support on the muddy surfaces that they are wading through. The three front toes of swimming birds such as ducks have been fused by a web that gives them propulsion in the water. The grebes' toes are separate, yet they have flaps that efficiently propel them through the water.

The barred owl and the red-shouldered hawk are both superb predators, perfectly adapted to their common habitats. One ornithologist suggests that the differences in their feet may be adaptations to the time of day when these birds hunt. The owl's outspread talons may cover an area more uniformly than the hawk's, an advantage to a night-hunting species that relies more on sound than on sight to guide it to its prey. Unlike the owl, the day-hunting hawk sees its prey clearly and can use its wings to make minute adjustments as it draws near.

Make no mistake about it, both approaches work. The differences in their feet tie each bird species to its environment just as successfully as their wings enable their common possession of the air.

WANING OF THE WOODCOCK

The timberdoodle is not yet endangered, but its decline is of increasing concern to biologists and upland gamebird hunters who prize this migratory visitor to our state.

by Vic Venters

The woodcock popped into flight a foot or two in front of my setter's nose, just as always, its butternut brown wings carving an airborne escape through switchcane and greenbrier. My side-by-side followed it quickly, just as it always has, a marriage of sleek Italian steel to my cheek and hands. Somewhere in that bottomland thicket, the barrel's little brass bead intersected the woodcock's twisting path, the safety clicked off, a finger slipped toward the cold curve of a trigger.

And then I stopped. No smoke, no fire, no spraying lead—only the fading laugh of the timberdoodle's twittering wings broke the stillness of that December morn. Top, my setter, shot me a disdainful glance—God only knows what a bird dog thinks—and began to pant like an exasperated child.

"Not this time, Top. It's no longer the same as it always was."

No longer, indeed; woodcock populations have crashed a disastrous 32 percent over the last 20 years in the bird's Eastern Flyway and are down about 17 percent in the Central Flyway. This past season, I repeated the above scenario time and time again, drastically cutting my harvest of woodcock, taking only a couple of pairs. This year, merely working our dogs was enough for me.

When a favorite species is declining, we all want to hear straightforward answers. "What's wrong?" we ask the biologists, "And what can we do to stem these declines?" Unfortunately, with woodcock, those answers are not easily forthcoming.

Most of the available evidence points to habitat alteration and destruction as the major factors in population declines for woodcock. Some biologists believe overhunting may be playing a role, although few studies have addressed this controversial issue. Additional factors such as increased winter mortality and predation only muddy the waters. "We just don't know all the reasons behind these declines," said Brad Bortner, woodcock specialist for the U.S. Fish and Wildlife Service, the federal agency responsible for managing this migratory game bird.

This uncertainty exists because biologists simply don't have a good understanding of the woodcock across its breeding and wintering range. Unfortunately, there are several factors working against a better understanding. First, the bird is hard to study. Its reclusive habits, mottled coloration and dense habitat requirements make studies expensive and difficult. While there have been adequate studies on woodcock biology on its northern breeding grounds, researchers understand little about the bird's wintering behavior or survival rates in the South. While the Fish and Wildlife Service is currently conducting a winter survival study in the South, the Service is also in the midst of managing a waterfowl population crisis, and funds are not exactly plentiful for the less "popular" woodcock. And because the timberdoodle evokes little hunter interest in the South, southern wildlife agencies are hesitant to spend research money on a bird considered

Mottled brown, *this woodcock blends in perfectly with the leaves that carpet a hardwood bottomland, the woodcock's favored southern habitat. While this coloration hides the bird from predators, its camouflage and reclusive nature have also made it a hard bird for biologists to study. After decades of research, wildlife biologists still do not understand all the factors affecting woodcock population declines.*

a "secondary" species.

Money shortages notwithstanding, you might be surprised to learn that the coastal plain of North and South Carolina is considered the woodcock's principal wintering range for Eastern Flyway birds. We even have woodcock living and breeding in the state year round, although most of our wintering birds head north in the spring for breeding grounds in southern Canada and the Northeast.

Unlike the adaptable mourning dove, woodcock need very specific habitat: young forests located on moist ground in combination with open fields. The thick brush in these young stands provides excellent nesting habitat and protection from predators. It also shades out grass and other herbaceous vegetation, allowing the woodcock to probe the ground for earthworms, its favored food. Woodcock need the open fields for nocturnal roosting and courtship rituals. Males use these fields as "singing grounds" for their airborne courtship, a spiralling, pirouette-like flight performed at dawn and dusk to attract females.

Unfortunately, suitable habitat in the Northeast is going the way of 25-cent movies. Typically, coverts mature and become useless in less than 30 years and are at their best for only 10 years. In the past, abandoned farms reverting to young forest provided ideal habitat. However, farm abandonment peaked after World War II and most of the coverts have outgrown their usefulness as woodcock coverts. Today, 90 percent of New England is forested and many landowners erroneously believe mature forest stands provide the best habitat for wildlife. Another problem is that the forestry industry in the Northeast is oriented to growing softwoods like pines, creating unfavorable habitat for woodcock production. And then there are the inevitable losses to human encroachment in the densely populated Northeast—every year priceless coverts are gobbled up by the never-sated appetite of "progress."

The picture isn't any prettier down South. Over the past several decades, hardwood bottomlands—the woodcock's wintering habitat—have been lost at a breakneck pace. In the Mississippi River alluvial floodplain, 80 percent of the bottomland forests have been converted to agricultural uses. Here in North Carolina, some of the Coastal Plain's finest woodcock habitat around Lake Mattamuskeet has been destroyed by wetland drainage and farmland conversion. In the Piedmont, prime bottomlands once flush with timberdoodle are today swimming with bass and bream, irreplaceable coverts lost to the waters of Jordan and Falls lakes. The effect this bottomland destruction may have on populations is compounded when you consider that woodcock also breed in the South.

HANSON CARROLL

***A lucky hunter** will be the recipient of this downed woodcock. While not heavily hunted on their wintering grounds in the South, woodcock are especially prized by upland hunters in the Northeast and Great Lake's states.*

Like any other species, woodcock populations are subject to the whims of Mother Nature. Extremely cold winters and late spring snowfalls can limit winter survival or breeding success. The Fish and Wildlife Service is currently in its second year of a winter mortality study in the South, a study initially begun in South Carolina's Francis Marion National Forest, an area described in the 1970s as holding wintering woodcock "as thick as fleas on a dog's back."

What Fish and Wildlife Service biologists found in South Carolina, however, were woodcock only as plentiful as bugs in a pesticide factory. "What struck us is that there were very few woodcock left down there," said David Krementz, the Fish and Wildlife Service biologist conducting the survey. And that phenomenon isn't restricted to South Carolina. "When I called up biologists who have worked with woodcock at one time or the other throughout the South, they all said the same thing—there just aren't many woodcock left." Krementz had hoped to radio-collar 30 woodcock—instead he got 15.

This winter, the study area was moved to Brunswick, Georgia, after Hurricane Hugo poleaxed the Francis Marion. (The loss of mature hardwoods to Hugo may improve woodcock habitat for a few years as the "next" forest generates brushy thickets). While the second year's data are not yet available, preliminary information from the first year of study indicates extremely low survival rates—about 65 percent for a 60-day period. The study birds were not subject to hunting mortality, and mammalian predators seem to be the chief cause of death. More complete data will be needed before the Fish and Wildlife Service can determine if wintering woodcock are indeed experiencing such heavy mortality. For now, the Service says, habitat alterations seem to be driving the declines.

However, there are biologists who feel that hunting is also limiting populations. For clarification, this issue needs to be addressed on two distinct levels: first, hunting's effect on resident populations on a local scale, and second, its effect on populations on a flyway or continental scale. Studies performed in the 1950s in Pennsylvania—where woodcock hunting is almost a religion—proved that local, resident populations could be hurt by hunting. Biologists analyzed a 2,000-acre state gameland that had a history of growing hunting pressure and declining woodcock populations. The study area was closed to hunting for four years, and at the end of that period, the spring breeding population jumped from six woodcock to 24 and the preseason population increased from 18 to 60 woodcock. Thereafter, Pennsylvania changed its regulations to allow more resident birds to migrate before the season opened.

Because hunting can reduce local populations, some biologists argue that hunting has affected continental populations. They maintain that because woodcock populations are made up of a composite of the local breeding populations, there is the potential for large-scale overharvest if many local populations are reduced. These biologists also note the woodcock's low reproductive rates—less than three survive each brood, thus limiting the number of "surplus" birds that should be taken.

Other biologists believe hunting is playing no role in the continental declines. Since the

***Many woodock** winter in North Carolina, and hunters can find them here after cold fronts drive them south. While destruction and alteration of habitat seem to be causing woodcock population declines, hunting's impact on the bird is not fully known. More research is needed to resolve that issue.*

1985-86 season, the Fish and Wildlife Service has restricted harvest on the Eastern Flyway, dropping the bag limit from five birds to three and cutting the season from 65 to 45 days. This is being done, the Service says, to keep hunting pressure consistent with the available resource, not because Service biologists believe hunting is behind the declines. They cite very low return rates for banded birds — about 4 percent — as evidence of low hunting mortality. They also point to vast areas of prime breeding habitat in the far North — areas such as northern Maine and southern Canada — that receive far less gunning than heavily hunted states like Pennsylvania. And in the South, they point out, woodcock are almost ignored.

That woodcock are "ignored" in the South may be for the best, argues Dr. Gene Wood, a woodcock biologist with the Belle Baruch Forest Science Institute of Clemson University in South Carolina. "Let me emphasize that I don't think hunters in the South are hurting populations now," Wood explained, "but that's because there are very few woodcock hunters down here.

"When woodcock get to the South in December, you are talking about a remnant population that has been shot for two months or more up North, and now the remaining birds need to be looked upon as a foundation stock for the next spring," Wood said. "These birds are in a portion of their range that has been free from major hunting pressure since market-hunting days. Wintering woodcock populations are also sedentary and tolerate gunning until cold weather forces them onward or they are depleted," Wood warned. "These birds need very, very careful analysis and it may not be wise to hunt them by the time they reach the southern grounds."

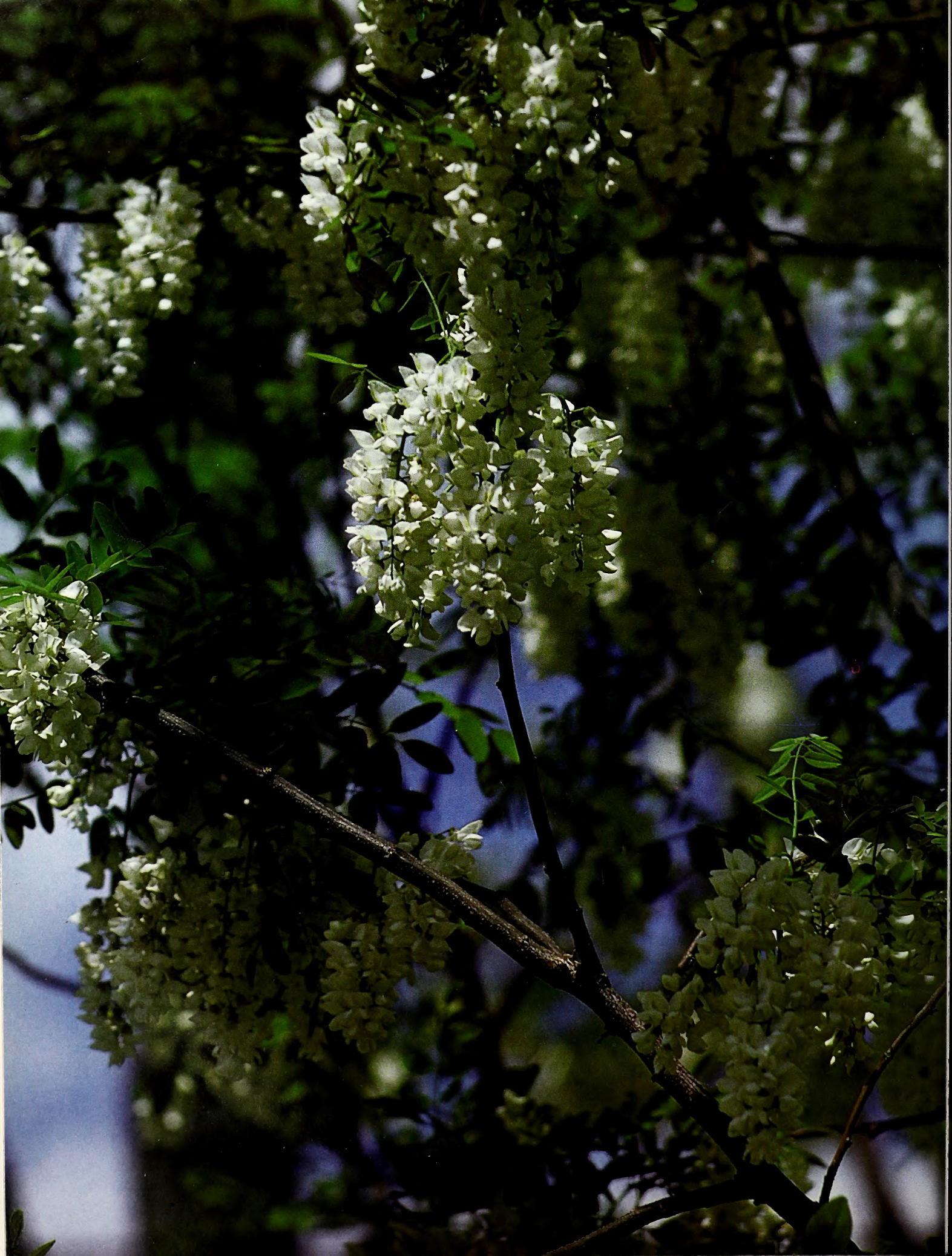
This talk of woodcock declines may seem odd to the southern bobwhite hunter who, on occasion, stumbles across good numbers of woodcock in a bottomland thicket. "Don't be fooled by this apparent abundance," says Wood. "All the birds are concentrated down South. It's like standing at the bottom of a funnel. You can't tell the sand is running out until the very end."

Given this unrelentingly gloomy news, is there any light in this picture? That's hard to say. Unlike waterfowl, woodcock have no $1.5 billion management and habitat protection plan in the offing nor is this situation likely to change. Also, most woodcock habitat — North and South — is in private hands, so large-scale woodcock management by federal or state authorities is impossible.

This leaves the bird with two narrow paths to recovery, both of them fraught with "ifs" and "buts." Private landowners in the North need to be educated about the need to reverse the trend toward old-growth forests. On this front, some help has come from the Service and the Ruffed Grouse Society in sponsoring workshops that show landowners how to manage land for woodcock. The trend toward bottomland hardwood loss in the South has slowed. Still, much work remains to be done on both fronts.

The Fish and Wildlife Service must also obtain more accurate harvest data. Current methods for measuring hunting pressure and harvest are crude. Estimates are little better than educated guesses. To this end, an inexpensive national permit for taking migratory game birds would be helpful in providing badly needed data, say Service biologists. Although this proposal has been defeated before, the permit concept may receive a better reception if it's proposed again.

About this time each year, woodcock begin their pilgrimage north to their ancient breeding grounds. Sadly, fewer birds are making this arduous migration with each passing year. Sadder still, their journey doesn't look to be getting any easier.



APPALACHIAN ALCHEMY

Of goats, bees and locust trees; and mountain traditions that still seek natural harmony in mysterious, and often effective, ways.

written and photographed by Doug Elliott© 1990

I once went to visit my neighbor, Theron, an older mountain man and farmer, and found him up on the hillside in back of his house. There, he had some goats fenced in on a gently sloping pasture covered with a stand of young locust trees up to 5 inches in diameter. Some might say that this piece of ground had been neglected, that it hadn't been cared for since it had last been plowed several years before. These thorny, fast-growing trees had quickly sprouted all over the field as locusts are wont to do. Because of their invasive nature, locusts are often considered nuisance trees and are notoriously difficult to clear from a field. If you try to grub them out or plow over them, each small piece of root that remains in the ground can sprout and become a tree.

The trees in this goat pasture had all been topped about 6 feet above the ground. It was early spring. The buds on most other trees were swelling, but I could see that these trimmed locusts were clearly dead. I asked Theron what he was doing with this piece of land.

"Last spring I fenced this in and put my goats here," he explained. "Then, last summer when the signs was in the heart, the moon was full and the trees was all leafed out, I cut 'em back. The goats ate the bark, the leaves and all the root sprouts that came up. And now," he said, grabbing one of the trunks with both hands at chest height, "all I have to do to clear them out is this." He began rocking the upright tree trunk back and forth until the dead root snapped off underground and he pulled the dead trunk out of the earth. "Now all I have to do is drag 'em to the house, saw 'em up and I've got good dry wood for the stove. The field will be cleared, and I'll be able to put my garden in here."

I was charmed when I listened to his simple explanation, casually delivered in his characteristic "down home" mountain drawl, and intrigued when I saw how well his manipulations of this overgrown patch of ground seemed to be working. As I thought about what he told me, I realized that his simple, straightforward explanation was a veritable interdisciplinary discourse integrating several completely different systems of knowledge all tied together with a strong thread of ancient folk wisdom, fine-tuned with intuition and tempered by years of down-to-earth, hands-on, practical experience.

In deciding to reclaim his "neglected" pasture, Theron first turned to the heavens, especially to the lunar cycle. The moon affects the tides and certain life rhythms of animals, and many old-time mountain folks also believe the phase of the moon affects the life energies in plants. Whether folklore or simply poorly understood fact, many believe the waxing moon exerts a magnetism that draws the plants' growth energy into the upper parts. As the moon wanes, these energies are thought to recede back down the plant to the roots and other underground portions. So, those who plant with the phase of the moon in mind usually try to plant root crops on the "going down" or the "dark" of the moon, while aboveground crops are usually planted on the "coming up" or "light" of the moon.

Though scientists question the practice, coordinating certain activities by the moon

***White blossoms** of the locust spill over spring's delicate foliage (left), a treat for the eye and also the palate when bees make honey from the nectar. Mature locust is strong, nearly indestructible wood that may outlast the person who cut it (right).*

A well-set locust post, it is said, will last a hundred years and then turn to stone.

***For those attuned** to old mountain traditions, goats become part of the remedy for clearing a pasture of persistent young locust sprouts, and preparing a future garden rich in natural fertilizers.*

is an ancient tradition that is also applied in other ways. For example, apples and other fruits that are to be kept for a considerable length of time are gathered on the "down side" of the moon because bruises are said to dry up. However, fermented foods like home brew, wine and kraut that have to "work" are best made during the moon's waxing. Firewood is also said to dry better if it is cut on the dark of the moon.

Since Theron was trying to clear his pasture of locusts, he waited for the full moon to draw the life energies up into the branches before he cut the trees back. He also consulted an almanac to find out the moon's position in the zodiac, an ancient practice of planting and harvesting by the "signs." Half the signs are considered barren and half are considered at least somewhat fruitful. The barren signs are best for weeding, plowing, cutting brush and harvesting, while it is thought best to plant and graft in the fruitful signs. Any given activity is thought to be best conducted on a day that falls on both a good phase of the moon and an ideal sign. This is what Theron did by cutting the trees on the full moon under an appropriate sign.

Animal husbandry comes into the picture with the management of the goat herd. Goats thrive when they can regularly move to fresh pasture and vary their diet. Free-ranging goats naturally browse on a variety of plants including grasses, shrubs, shoots and herbs, and they are masters at handling thorns. The locust trees not only nourished the goats but nourished the soil, as well. Their vigorous roots pull minerals and other nutrients from deep in the earth. Locusts are legumes, like peas, beans and most other pod-bearing plants. Agronomists tell us that legumes "fix" nitrogen, and nitrogen is essential to plants. It is the element they need in the largest amounts and is the one most quickly depleted in the soil. Nitrogen is abundant as the stable gas in the air but is available to plants only when "fixed" in another form. No plant can fix its own nitrogen, but the legumes and a few other plants form symbiotic relationships with microorganisms like Rhizobium bacteria that form nodules on the roots and bring the free-floating, ethereal, yet stable nitrogen "down to earth." The agricultural benefits of interplanting or alternating legumes with grain and other crops have been known for centuries.

By letting his field grow up in locusts,

Theron was actually practicing a laid-back form of long-term cover cropping, inoculating the soil with nitrogen. Pasturing the goats also cleared the field and added some manure which is, of course, another source of nitrogen. The wood he cleared from the field gave him a good start on the next winter's wood supply. The next year when he plowed and tilled the land, his garden produced well and continued to do so for a number of years.

I asked Theron if he might use some of those locusts trees for fenceposts.

"Naw, these are white locusts," he said. "They ain't good for fenceposts. A fencepost made of white locust won't last any longer than one made of poplar. It's the yaller locust that makes a good long-lasting fencepost. A yaller locust post'll last as long as you will."

Now I knew from my botany studies that the only tree-sized locust that botanists recognize in our region (other than the honey locust, which is uncommon in that part of the mountains) is *Robina pseudo-acacia*, known as black locust in tree books.

"What's the difference between a white locust and a yellow locust?" I asked. He explained that white locusts grow out in fields. They have white wood and are small, weak and wormy. Yellow locusts, on the other hand, are large trees that usually grow in the woods and have thick, deeply furrowed bark and dense yellow wood. Both have the same kind of flower and leaf.

When I asked a local logger the difference between a white and a yellow locust, he replied, "'Bout forty years."

Botanists classify plants by their reproductive organs. They examine the flowers and seeds and attempt to arrange them in an evolutionary order. They see the black locust as one species. Traditional mountain people don't care much about evolution. They tend to classify plants based on an intimate working relationship. People who work with locust trees can clearly see two kinds of locusts where a botanist only sees one. As for me, I tend to agree with Thoreau when he said, "I love best the unscientific man's knowledge; there is so much more humanity in it."

Locusts are one of the first of the woody pioneer tree species that invade fields and turn them back into forests. Ecologists call this forest succession. When locusts sprout in a field, they grow rapidly. For the first few years they may more than double in size every year. As they grow, they create shade, which discourages growth of open-meadow and pasture plants while creating conditions suitable for the seeds of shade-tolerant hardwoods to sprout and grow. Stands of locusts in a forest tell a tale of fields cleared decades ago. Forest locusts grow slowly and can attain large size. The wood produced is dense, deep yellow in color, and rot-resistant. This is the wood that is so prized for fenceposts. The best fenceposts are split out of a large yellow locust log that is cut in the winter when the sap is down. The bark must be scraped off, and the post is best driven into the ground and well-tamped. A mound of soil is left around the base of the post to facilitate drainage away from the wood. A well-set locust post, it is said, will last a hundred years and then turn to stone. Appalachian alchemy, I call it.

***This mature locust** has a sizeable trunk and deeply furrowed bark, a good indicator that it has survived long enough to acquire the rot-resistant strength to become one of our most useful native trees.*

Young locust saplings that first colonize a field are well-armored with sharp thorns. This protects them from deer and other native browsing animals. As bristling as they are, the thorns do not protect the trees from their worst enemy, the locust borers (*Megacyllene robiniae*) that dine on the wood. The damage is perpetrated by the larval stage of a beetle, a white segmented grub worm that hatches from eggs laid in pits cut into the bark. It eats its way into the young, white sapwood. As it grows larger it can eat into the heartwood and make a tunnel that is almost 1/4 inch in diameter. The larva overwinters in its tunnel in the wood. When just about to pupate, it burrows to the edge of the wood and pupates under the bark. The adult beetles emerge in late summer. They are about 3/4-inch long and strikingly marked with black and yellow stripes. They are known as "long-horned beetles" because of their long antennae. Wood is no longer a part of their diet, and the adults spend most of their time on goldenrod flowers in late summer sipping nectar, eating pollen and mating. Maybe that long, dark year crunching through North America's toughest wood does have its rewards, however. Goldenrods are usually common in the same overgrown fields the locusts invade.

Flowering time for locusts is usually in April or May. The fragrant dangling clusters of white pea-like flowers often cover the tree. Some years they produce copious amounts of nectar during the brief two-week bloom. Occasionally, this provides nearby beekeepers with a bumper crop of heavy-bodied, white, elegantly flavored honey. In North Carolina, locust honey is often called "the beekeeper's honey" because the locust bloom is very unpredictable, and on the few occasions when beekeepers harvest a crop, it rarely makes it to the market. Beekeepers usually squirrel it away for their own use.

Locust blossoms are not only beautiful, they are edible and even drinkable. I like locust blossoms in salads. They lend a flowery touch and taste a little like mild, sweet garden peas. Locust blossom fritters are another favorite. To make them, I pick a batch of the flowers at the height of their blossom, remove the blossoms from the coarser stems and fold them into a light pancake batter. I cook them on a griddle like pancakes or deep-fry them in hot grease and serve them with syrup or locust honey (if you can wheedle any out of your friendly local beekeeper). The most elegant way I know to serve locust flowers is as a locust blossom cordial. To make it you must have freshly opened locust blossoms, best gathered in the morning before the bees and butterflies have sipped the nectar. Loosely fill a container (ideally a glass pitcher) with the flowers and then cover with cool spring water and stir gently. Set the pitcher in a refrigerator or other cool place for about an hour and serve in wine glasses. Allow a few flowers to spill into each glass as you pour. The drink has a delicate bouquet and the nectar imparts a subtle but distinctive sweetness. One of the benefits of this beverage is that you can drink glass after glass of this cordial and still drive home safely. ⊠

Doug Elliott's most recent book, Woodslore and Wildwood Wisdom, *can be ordered from Possum Productions, Rt. 1, Box 388, Union Mills, NC 28167, for $10 postpaid.*

Snakes Snails & Puppy Dog Tails

Remember that pickled frog you dissected in school? Chances are it came from Carolina Biological Supply where scientific educational products include everything from maggots and tarantulas to kits that teach genetic engineering. Almost everything, that is, except puppy dog tails.

written by Eddie Nickens
photographed by Melissa McGaw

Think bugs. Not just a moth or two busily buzzing a lamp post, but thousands of arthropods scurrying across the floor and scratching unseen in boxes and bins. Great balls of bugs in clusters as big as wastebaskets, each bug half the size of a dollar bill.

Now think spiders. No, not just a single daddy longlegs, but tarantulas, dozens of them, each enclosed in its own plastic box, each box a sort of transparent brick in a stack from floor to ceiling.

Now, think frogs. That's right, not just a lone hoppy-toad, but drawers full of frogs—bullfrogs, giant toads, tadpoles, even the rare albino *Xenopus*, the African clawed frog. Bushels and bushels of frogs.

All of this may seem like a nightmare to those with stomachs that turn at a harmless house spider or two, but it's actually all part of a very different dream. And this dream came true for Dr. Thomas Powell Jr. of Burlington, North Carolina, professor of biology at Elon College in the 1920s, when he founded Carolina Biological Supply Company in 1927.

There are a few common building blocks of education—the quadratic equation, *The Canterbury Tales*, and flag football played on mud flats. But of all the shared experiences of a North Carolina education, perhaps none leave as lasting an impression as classroom science experiments. And chances are very, very good that many of the supplies for those experiments—from the first grade through graduation day, from the microscope slides of a fish gill to the plastic model of a human heart—came from the Carolina Biological Supply Company compound in Alamance County. From a cottage industry to a corporate giant with more than 30,000 items for sale, the dream of Dr. Thomas Powell Jr. has proven that awareness and concern for our living planet, like planaria and fruit flies, can well be raised in a petri dish.

That vision took Powell out of the classroom and into the fields and ponds of Alamance County during the early '20s. Science teachers then were expected to provide many of the specimens used in classroom instruction, and enthusiastic educators were as likely to be found scooping up mosquito larvae from nearby ponds as lecturing at the podium. To Powell, snaring bullfrogs had its charms, and he soon began to enjoy the business of supplying organisms as much as he did the practice of studying them. He began sharing his finds with other teachers and soon decided his was an unfilled niche. The educator turned entrepreneur; Powell quit his job, founded Carolina Biological Supply Company and began spending his days camping across the state and collecting specimens. (It is legal to capture and sell unprotected species.) He was actively in-

volved in the company until he died in December 1987 at the age of 88.

"At his death he was the most entrepreneurial member of the family," said Thomas E. Powell III M.D., Powell Jr.'s son and successor as president of Carolina Biological Supply Company. "Anything that we achieve in the next 10 or 20 years I think it can be assumed that he envisioned."

Yet, the scope of Carolina Biological's achievements over the past six decades is startling. What began as a sideline to a teaching career is today one of the world's leading suppliers of bugs, spiders and frogs — as well as histostat rotary tissue processors, electrophoresis marker protein

Still fearsome, *this rattlesnake skeleton (above) is being prepared for shipment by Allen Hardy in the Osteology Department. Like 80 percent of the company's products, the bones will no doubt end up in a classroom. Live specimens, like these red-legged tarantulas (left), comprise a significant part of the more than 30,000 items the company advertises.*

The insect-eating *purple pitcher plant (*Sarracenia purpurea*) is popular for classroom study. To avoid collecting these increasingly rare plants from the wild, Carolina Biological secures its pitcher plants through tissue culture and purchases still other seed-grown specimens.*

kits and geometry practice exercises. Since the 1940s, sales have doubled every half decade or so, spurred by landmark occurrences in the world of science—the launching of Sputnik, the rise of genetics, the marriage of biotechnology and commerce applications. Today the company sells to science teachers, medical schools and other science organizations around the world. Carolina Biological hosts seminars nationwide for science teachers (those seminars are approved for teacher credit in North Carolina) and publishes biochemistry textbooks, molecular biology lab manuals and educational videos aimed at students of all ages.

"A preserved frog is not a preserved frog is not a preserved frog," said Powell. In his office, bookshelves are lined with mineral specimens and replicas of skulls of primitive man. A portrait of the elder Powell looms over his desk. With all company products, he said, from preserved specimens to intricate laboratory equipment, "there is a way to do it with great care."

The breadth of Carolina Biological's offerings is immediately evident out in the buildings that house the company's stocks, items organic and inorganic. Though the company was founded with bullfrogs and hydra (tiny, anemone-like freshwater animals common in local ponds), it now supplies schools with educational materials from every scientific genre imaginable. Divided into departments like some sort of retail taxonomy—living animals, preserved animals, microscope slides, diagnostic media—a walk through the 48-acre, 15-building compound is very much like a walk through the history of science.

"When we say we're catching up on inventory, we mean it—literally," said Kim Bayliff, a lab technician in the living zoology department. She mixes butterfly food in a crockpot, standing near a wall covered with stacked plastic boxes in which tarantulas reside, sized from the newly born to the ready-for-shipping. A sign on a nearby door warns, "These Premises Patrolled by an Attack Tarantula."

"I don't really like them," Kim admitted of her multilimbed charges. "They get out all the time." She points to a particular spider, a red-legged female. Females make the best pets, she assured, for they're the most docile.

"This department is faced with a monumental task: rearing, raising and keeping alive their goods from the time they arrive, via shipment or birth, to the time they reach the customer." Department employees have, no doubt, invented some ingenious shipping mechanisms, from double-walled containers to those designed to maintain air supply to living specimens. Carolina Biological is increasingly relying on lab-reared specimens to supply orders, which can number 3,000 per day during the late-summer peak season.

Still, Kim's is nice work, if you can get it. Consider one of the dirtier jobs in the company business. Stacked in stainless steel trays beyond a heavy door to a hot concrete bunker, swarms of maggots blanket rotting beef liver in what is affectionately called the Maggot Room. Holes drilled in each corner of the trays funnel the larvae to a collection dish below. A wandering maggot takes a misstep and *voila!*, your order is filled.

"Everybody thinks that maggots are nasty, but actually they are quite clean," said

exhibits manager Scott Jewel, after we'd shut the door to the Maggot Room, still gasping from the heavy ammonia smell.

"That's right," piped in Harry Shoffner, director of advertising for Carolina Biological, and our unofficial company tour guide. "They never complain. They never go on strike. They just have a tough job to do."

I assured my companions of my understanding, but further excitement would have to wait. Could they point me to the restrooms, please?

Sure. Go down this hall and pass the Maggot Room and the Fly Room and the restrooms will be on your right. Just before the Roach Room.

Gee, thanks.

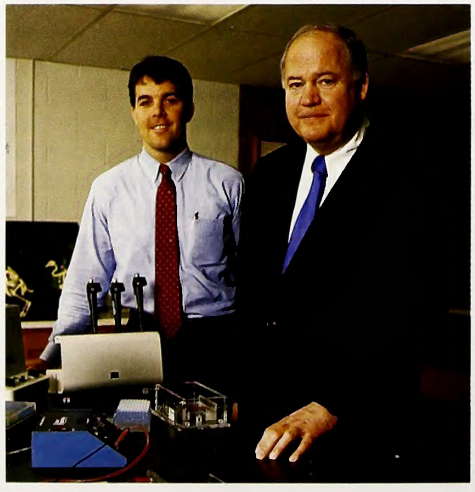
Yet not all of Carolina Biological's wares creep, crawl, fly, buzz or slither. Keeping up with the changing cutting edge of technology means the company must always look to the future for tomorrow's supplies.

"Now the emphasis is more and more on biotechnology," explained Shoffner. "The DNA technology and fingerprinting, the cloning—those technologies are becoming more and more important. The traditional goods, such as hydra and *drosophila* (fruit flies), are still necessary for a basic scientific education, but we're really moving forward to new technologies."

Take genetics, for example. New breakthroughs in science often mean new possibilities for science education. Whereas

***Using the thorax** of a bee, Charles Corriher pollinates fast-growing plants in the genetics department. Growing from seed to seed in about 35 days, these "fast plants" make it easy for students to study all aspects of plant biology.*

Photographer Jeff McAdams *(above) cradles a lab-reared bullfrog, one of the many live specimens shipped by Carolina Biological. At right, company president Thomas Powell III stands with David Dupont in the biotechnology department. Powell is the son of the company's founder who died in 1987, 60 years after launching Carolina Biological Supply.*



fruit fly crossbreeding used to be virtually the only possible training tool for high school genetics instruction, new technology has diversified the field. One of the most exciting new offerings is a plant biology kit that utilizes a special strain of *Brassica rapa* — a cousin to the brussels sprout — that goes through a complete life cycle in 35 days. Developed by Dr. Paul H. Williams, a plant pathologist at the University of Wisconsin-Madison, the rapid-cycling Wisconsin Fast Plants (TM) will allow students to study multiple generations during the school term, manipulating more than 150 genetically controlled traits.

Another cutting-edge curriculum at Carolina Biological is offered through the Cabisco Biotechnology department, which works in conjunction with the DNA Learning Center of Cold Spring Harbor Laboratory in New York state. DNA extraction kits are available that enable high school or college students to remove DNA from freeze-dried *E. coli* cells (a species of bacteria found in human intestines, and widely used in research). Another kit allows students to observe the effects of adding new DNA sequences to living bacteria. Experiments that used to be possible only in the most advanced laboratories can now be duplicated in the classroom — all from the catalog of Carolina Biological Supply Company.

"We want to show students how exciting biology really is," Powell said. "The hydra is still the exciting coelenterate that you can have there in the dish waving about, and kids can go out and look for it in their communities. They don't even know about it, perhaps, until they see it in the classroom. These classic one-celled forms, bacterial colonies and frogs all help kids, I think, relate to chemistry and biochemistry, and the kids become much better investigators of the world around them.

"But what turns us on most is to relate molecular biology to some of the things that we've been shipping for 62 years, for there is now the opportunity to blend what was the classic biology with what is now the new biology."

That relationship is increasingly at the fore of Carolina Biological's operations. To bridge the gap between technology and education, the company works closely with teachers in North Carolina and beyond and has ventured into educational videotapes and book publishing. Its first textbook publishing venture, *Biotechnology*, published by its Neal Patterson Publishers department, has been adopted around the world and by the likes of Duke University, UNC-Chapel Hill and Harvard.

But just because they don't squirm or

Jackie Morris *gingerly uses a pipette to inoculate algae in an Erlenmeyer flask. Kept in a growing medium, these lower plants are used in the classroom to demonstrate different types of growth and reproduction.*

wiggle doesn't mean the new generation of Carolina Biological products are less captivating. "Our products have to be exciting to capture the attention of students," Powell said. "If children are going to watch six or seven hours of television a day, they might as well watch some of our videos. We think they are less damaging to the mind than many things on TV."

Still, Carolina Biological's identity remains largely rooted in life-forms common in North Carolina. From Allen Hardy's skeleton room to the selection of 3,500 different varieties of prepared microscope slides; from the fungi growing in bunny dung to the curly-winged, plum-eyed, stubby-haired fruit fly, Carolina Biological has sunk its roots deep into the fertile soil of scientific education.

"When we send these to our customers," said cultures department head Bill Pendergrass, who had just returned from a hydra-collecting trip that morning, "they know the specimens are just the way the good Lord made them grow—that way the students get a truer picture. So while the teachers and the professors sit in a warm dry room, they depend on us to go out and get cold and wet and dirty."

But his eyes light up when he thinks of his mission. "You see, it's not just a matter of what the hydra looks like in some textbook," he explained. "Why has it become the thing that it is? That's why we're here." ⊡

She Brought Nature Outdoors

interview by Lawrence S. Earley and A. Sidney Baynes

You won't learn about nature by looking in a book, science teacher Gladys Baker told her classes. Years later, her students still remember that she made science fun.

Who doesn't remember the teachers in our lives, the one or two that touched us in a special way? We look at the world the way we do at least partly because of their words and their example.

One teacher that many remember in this fashion is Gladys Baker of Zebulon, who taught for more than 40 years in North Carolina schools. About her long experience in the classroom, she says wryly, "I've taught everything from kindergarten to college, except for fourth grade. That's the hole in my experience, but I'm not going to go back and try to fill it, believe me."

Ms. Baker began teaching science when it had just been introduced into the elementary school curriculum. She made a difficult subject fun by taking her classes into the outdoors and developing an early form of environmental education. "She put learning right there in the neighborhood," one of her students remembers. "It made the world around me more meaningful, and it was fun."

Gladys Baker would be the first to deny that her experience was substantially different from that of other teachers. For many years, almost all elementary school teachers were ill-prepared in the sciences, looking for information and help for their classes when there was little help to find. Today, environmental education has become a rallying cry for conservationists alarmed at the state of the natural world. And although many teachers on the elementary levels still feel weak in science, they have the benefit of supplemental courses, including the Wildlife Resources Commission's own environmental-education workshops, Project WILD.

Wildlife in North Carolina *visited Ms. Baker in her pre-Revolutionary War home in Wake County, where she offered us spiced tea and homemade candies. While we examined her quilts and other handmade crafts, she told us about her experience as a teacher.*

MELISSA McGAW

A schoolteacher *for over 40 years, Gladys Baker stands in front of her family home in Zebulon. Ms. Baker taught science in elementary school, creating an early form of what is today known as environmental education.*

I was born on December 29, 1906. I'll be 83 soon. I always have to stop and subtract. One year, students in one of my eighth grades asked me, "Miss Baker, how old are you?" I said, "Now, that's none of your business." And they looked at me in utmost astonishment that I should have been so rude. All their parents knew me, their grandparents as well. But you just didn't ask people how old they were, right in their face, right in public. I don't know if they ever found out how old I was because there was no way I could keep my age secret, living right here, among everybody.

The only time I ever cared about having my age known was when I first started teaching. I was 19 years old, teaching high school math, and there must have been six or eight boys in my math class who were older than I was. I didn't try to hide it, but I

didn't advertise it.

The reason why I was through school so early is that I skipped a couple of grades. In those days there was no kindergarten. You just started school when you were six years old. But the teacher thought I was real cute and such a smart little girl, so she finally persuaded my mother to let me go to school at five.

It was right at the edge of the yard, practically. It was what they called an old field school. And if you don't know what that means, you didn't listen in history class.

Back in the good old days you cleared some land and grew a crop and when you had grown enough crops on it that you had completely depleted the mineral resources in it, you didn't go to town to buy some fertilizer, you just simply abandoned that field and cleared another one. And so the old field school was a building built in an old field that was no longer used as a field. And that's what my mother's uncle Albert Ray and his father built so that he could teach his brothers and sisters how to read and write and figure. And sooner or later the neighborhood kids drifted in. I mean there was no place for anybody to learn that kind of stuff unless you had made private, individual arrangements. And so that was the Ray school house.

I went to the University of North Carolina at Greensboro. It was called Woman's College at that time. When my Aunt Grace went there, it was the State Normal School — that was what everybody called it. Then by the time I went, it was Woman's College. And now of course it's part of the university system. And we thought we would never be big enough to have 2,000 students in the whole school. It was that long ago. I finished high school in 1922 and I went to Woman's College until 1926.

I've taught every grade from kindergarten to the college level, except the fourth grade. I taught at Clayton School in Johnston County in 1926. I was trained to teach high school math and I did it for a while, and then my mother was ill for four or five years and I stayed out of teaching and kept the household running. I learned how to cook turnip greens, and that's no small achievement, believe me. I started back teaching in Wendell in the mid-thirties until the later 1940s. Then I taught for five years at Hardbarger Business College. After that I went to Zebulon, to Wakeland School. That would have been in the mid-forties.

I taught in Bladenboro next. I came back home and taught in Knightdale for three or four years, in Wake County. Then I went back to Wendell and taught for 10 more years. That brings us to 1969 when I retired.

I've always been interested in the natural world, mostly because I was just living in the middle of it. I just grew into it. My father was a farmer and of course he enjoyed things outdoors. He knew a lot about the weather. We'd hear a rumble of thunder and see some clouds overhead. Poppa would go out and look around. "That one's going around," he'd say. Sure enough, it wouldn't rain here. It would rain across the street at Pierce's.

They didn't seem to realize that it wasn't going to do us a lot of good to learn something about the theory of education if we didn't know how to get up and teach a history class.

The best teaching I ever did was when science was introduced below the high school level. I started teaching science in the seventh and eighth grades because I had to. I was trained to teach high school math, so what in the world did I know about science? In those days, you just taught what you were told to teach. Teachers were really very poorly prepared. Education courses, which were supposed to prepare us, were as near as no courses in school. There was just nothing to them. They didn't seem to realize that it wasn't going to do us a lot of good to learn something about the theory of education if we didn't know how to get up and teach a history class. We just had to learn by main strength and awkwardness. That's the absolute truth.

I don't think teachers ought to teach out of their field. I mean, you ought to be prepared for what you teach. But in my particular case it worked out just fine because I simply could not be happy until I learned what I had to teach.

The science that I was teaching, it was what you might call "nature study" now. A real scientist would be terribly upset about it. But nobody was prepared to teach science then. The only science we had was chemistry and physics in high school and general science, which was sort of like civics — a little bit less than no course at all. You start kindergarteners these days collecting leaves and making scrapbooks. Well, this was just as new to my eighth graders as it is now to a five year old.

I decided that a really worthy thing to do was to teach the children to look around them and see what was there, to appreciate and enjoy their own immediate environment. That was mostly a matter of expediency, because that's where they are to begin with and that's where we could get specimens — plants, for instance. I could pick all kinds of daffodils or whatever right out of my yard. And if you're going to learn the parts of a flower, why not learn them on something that grows in Grandma's backyard?

For instance, they learned that photosynthesis takes place as long as the daffodils have their green foliage. You don't cut them down until the foliage turns yellow and dies. And why don't you? Well, because it's making food, just as long as it's green. That kind of thing.

We would have a unit on insects, for instance. Now, nobody said what insects I had to teach so I didn't see why in the world I couldn't pick something interesting and something that was available. A butterfly or a moth is a beautiful thing to see and it is available. So one of the things we would study was butterflies and moths.

At the beginning of that year, I thought I could recognize a tiger swallowtail butterfly, but I would certainly not have argued with anybody. And by the end of the year every kid in that class could recognize at least 50 moths and butterflies. That was the kind of teaching that I tried to do because it was useful, it was valuable, it meant something to them.

I would have three or four little girls come to me with books stacked up and open to the right place. They were almost fighting among themselves. "Now I know that this is a cabbage butterfly because it's white and it's got black spots." "Yeah, but this one in the book has two spots and that one has three. It can't be a cabbage butterfly." I mean, they were learning. They were really learning.

It was just a matter of self-defense. I didn't know anything better to do. I had to keep my own self interested enough so that I could stand to get up in the morning. And I had to do something to keep the kids happy, because I can't think of anything worse than being shut up in a classroom with 30 miserable eighth graders.

When I was teaching in Wendell, in the late 1950s, I was teaching science and English, not having been trained in either of them, but having learned the hard way how to get results, which is what counts. And I thought I was doing a pretty good job with both of them. I was having the best time.

When we came to an astronomy unit, I took particular pains to study mythology stories for our reading. And then for our science class we'd go out and look at all these constellations, which were named right out of the Greek and Roman mythology stories. For art, each person drew a constellation and put it on a big piece of poster board that fit the windows in our classroom and put nail holes in them for the magnitude of the stars, you know. We'd have little nail holes, middle-sized nails and big nails. And we didn't have to know the exact magnitude of the star, but after all, at that level if we learned that this one was bigger than that one, that was sufficient. We drew the mythology character Andromeda, for instance, reclining on her rock with her beautiful blonde hair streaming out behind her. And we would draw the mythology picture in great bright poster paint colors—it was as garish as we could get it, really. We wanted to see it from a distance. Then we punched holes where the actual stars were in the constellation.

We got it all done, I recall, before a county teachers' meeting. The number of teachers was small enough that we had our regular teachers' meetings in the schools around the county. Our windows faced the auditorium and the teachers were going to leave the auditorium and visit our classrooms. So we had all these posters stuck up on the windows, all the windows were covered in them. And in the daytime we could see the light shining through the holes and be reminded of our constellation as well as seeing the painting that we had done. As the guests approached the building, they could see the light shining through those holes. And it really did look like the constellations. I was so proud of that I didn't know what to do.

Mostly we studied astronomy from direct observation. This was long enough ago that at night we could go out on the football field near the school where it was pitch dark, and I'd point out the constellations with my flashlight.

After I did my first class, I called on members of that class to help me with the next class and they were delighted. We would divide up into groups and scatter ourselves around the field out of each other's way and when one of my student helpers had pointed out the Little Dipper and the Big Dipper and whatever to his little group, they'd come back and show it to me.

Teaching was always a matter of doing whatever worked. If it worked, we did it. If it didn't we tried something else until we found something that did work.

I delegated my authority. We just had the best time, and if we had any problems I never heard about it, and I'm sure I would have heard about them.

I always wanted to teach my students how to manage their own affairs. For the longest time students were accustomed to being taught with a hickory stick. I mean, the teacher dictates everything that everybody does. Nobody can work independently. Under that kind of a system, children are completely helpless left by themselves.

Well, those children are not that stupid. They could learn better. So for a long time I would organize my whole class into an Audubon Junior Club. These were nature clubs established by the National Audubon Society. The children would elect officers and conduct their business according to parliamentary procedure. And they would do this without me.

It was part of my science class. They would have their science class at an Audubon Junior Club meeting. Whatever needed discussion, they discussed. Even if I was just going to teach the class, just explain something to them, they would start the meeting and then turn the meeting over to me and I would do whatever I wanted to do. Sometimes they just had business to attend to. Sometimes there were different projects that different groups were doing, and we'd have a report on those.

When we studied insects, for instance, we would make terraria containing plants and insects. In the good old days, the lunchrooms got mayonnaise and various things in glass jars. And so every year they saved me enough glass jars for each child to have a terrarium for himself. They learned about plants, that the roots are down and the stem is up. They learned that plants needed drainage and whatever else you learn to make a garden grow. They had their garden in miniature. And they learned a certain amount of art, as a matter of fact. I mean, you've got to have your landscape in certain proportions to be pleasing. We made one for everyone to enjoy. You're learning about plants, how they grow, what they need to grow. You're learning about insects.

I would try to stay out of the way until they got started. They were doing it all themselves. I used that as a vehicle not only for teaching science, but for teaching parliamentary procedure, for teaching independence, a few other things that I thought they ought to learn. It worked out just fine.

With me, teaching was always a matter of doing whatever worked. If it worked, we did it. If it didn't, we tried something else until we found something that did work.

One little fella said something to me one time that meant more to me over all these years than just about anything else. I believe we were doing earth science that year. He looked up at me and just as serious as he could he said, "Miss Baker, I just thought of something. We're learning a little bit about a whole lot of things now. When we get older and quit work and retire, we can go back to pick up any one of these things and learn a lot about it, can't we?" I said, "Yes sirree, you certainly can."

He had figured it out. I thought, well, you've not only learned something, you've learned to think. ⊠

"Carolina Profile" is a periodic feature in Wildlife in North Carolina. *In these interviews, men and women reflect on their outdoor experiences and on what the land and its resources mean to them.*

Fly By Night REFUGEES

High in the mountains of western North Carolina, the northern flying squirrel clings to its southernmost home, studied by biologists and threatened by its close kin.

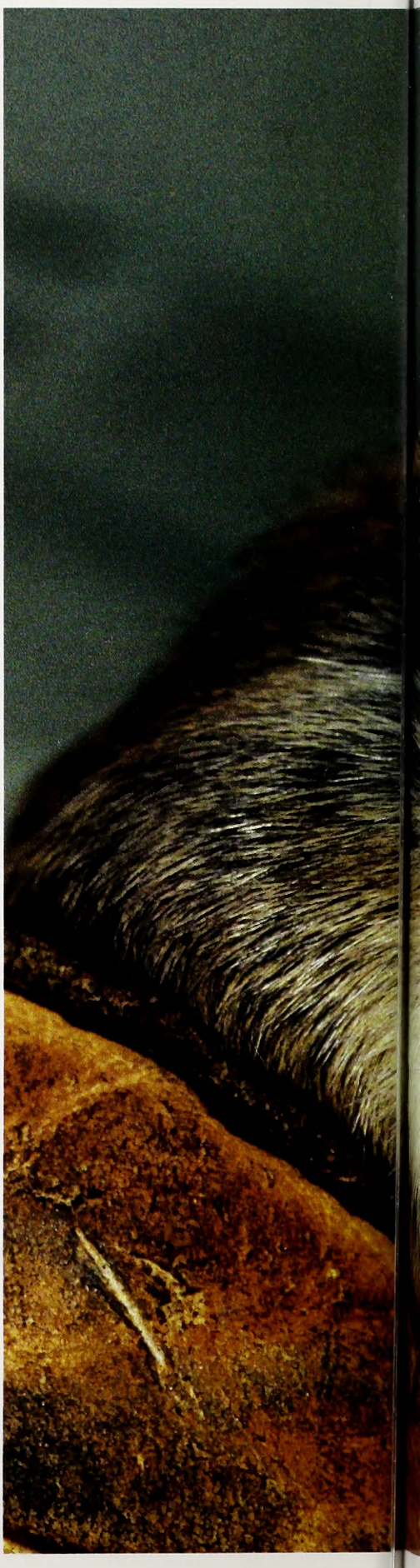
written by Dr. Peter D. Weigl
photographed by Ken Taylor

Young biologists nowadays receive stern warnings about the kinds of animals they should study during the early parts of their careers. "Find something that is common, easy to collect," they're instructed, "and get large samples for analysis. Choose a beast well-described in books and journals, ask a nice manageable question, construct an answer with a lot of numbers, publish and go on to another problem." Nobody can argue with such well-intentioned advice in the great game of science and academics, but it does not suit everyone. And it does not always provide much in the way of vital information on rare animals or data on novel adaptations.

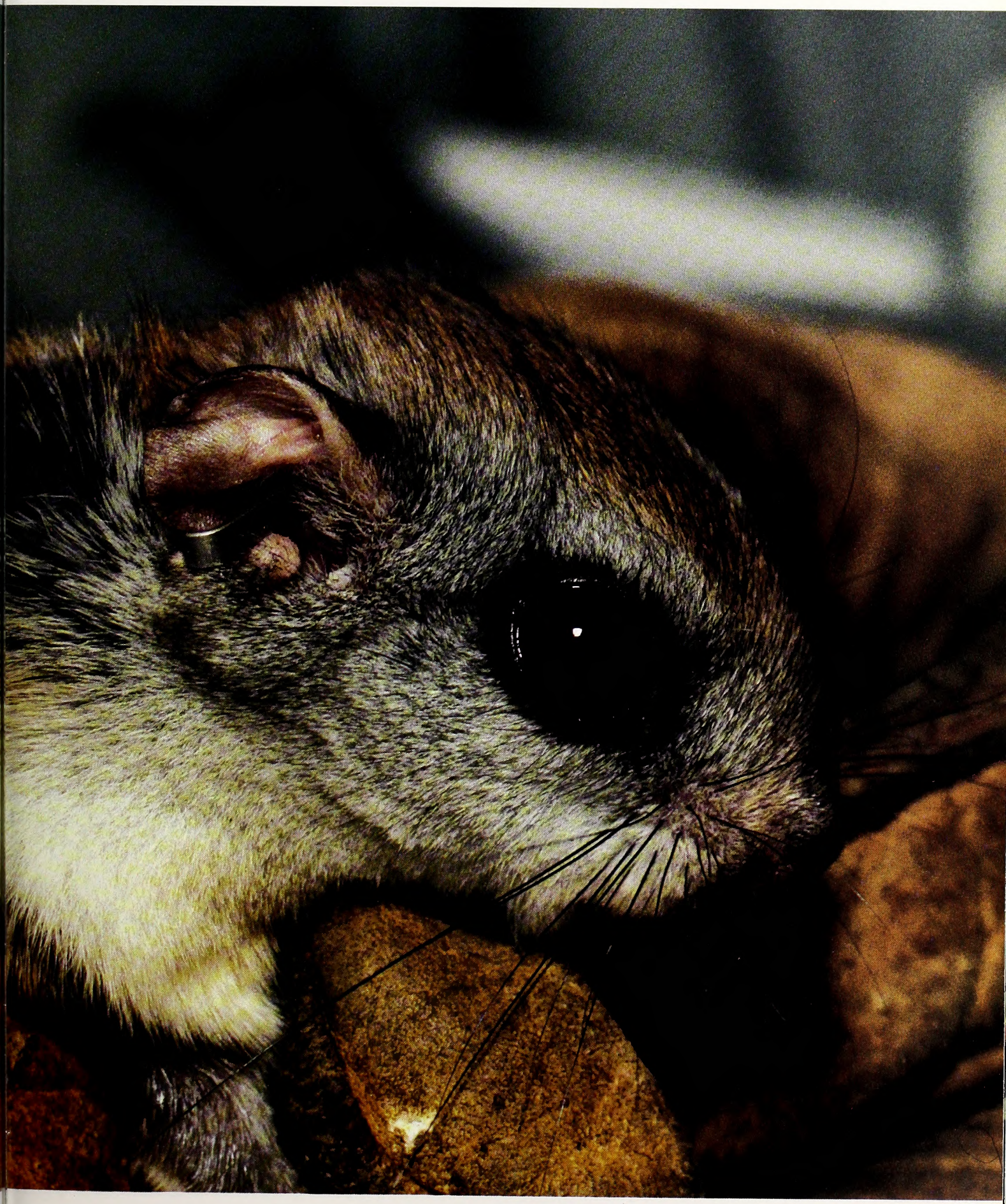
As a particularly contrary graduate student starting on a study of animal competition in 1964, I badly needed live specimens of the two species of flying squirrels found in North Carolina. One species, the southern flying squirrel, was a good experimental subject: abundant, widely distributed, collectable and well-studied. The other species, the northern flying squirrel, was known from only five or six specimens in North Carolina and collected on only a few peaks of our higher mountains. In other words, as a scientific subject it was abominable!

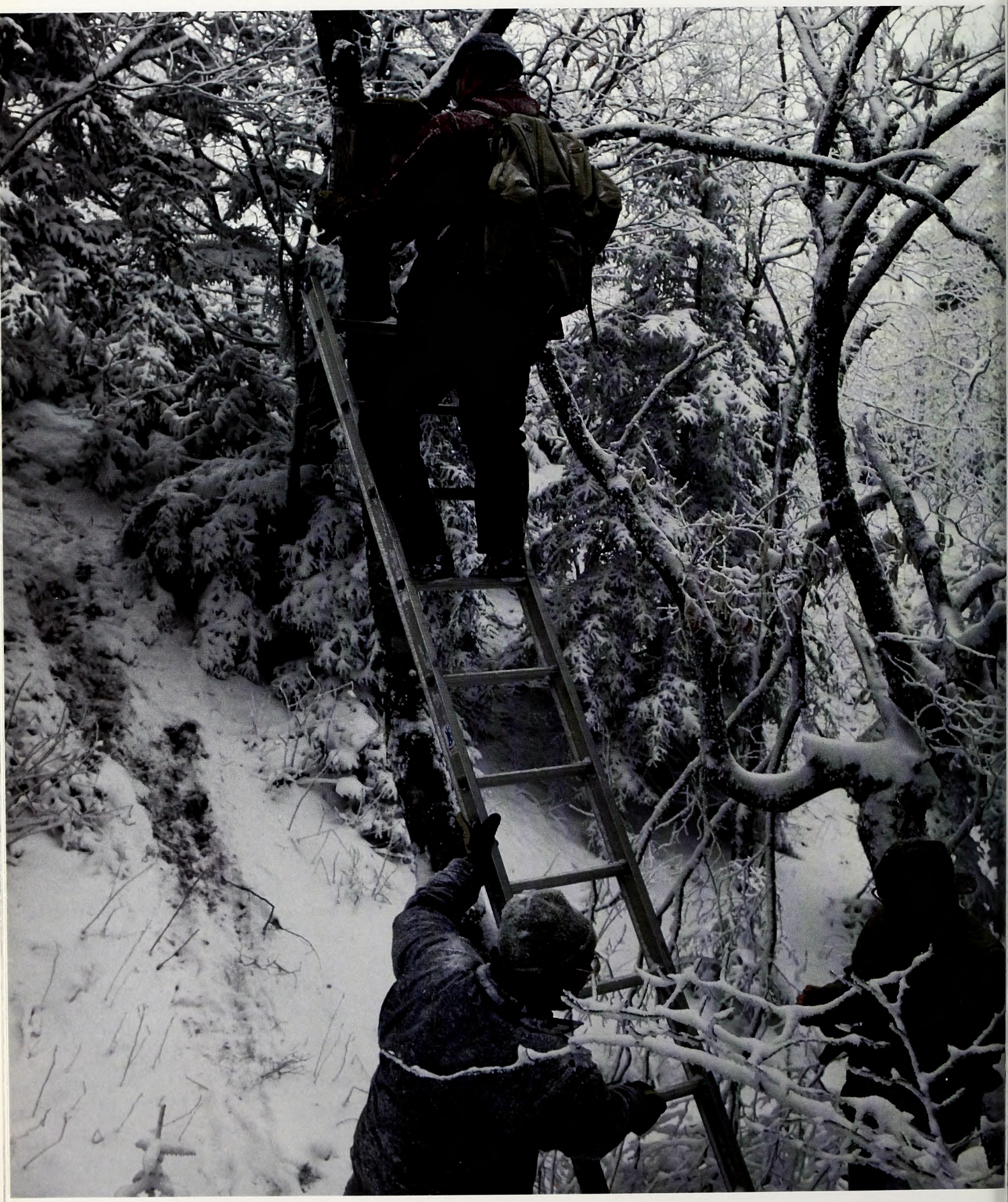
It was not too surprising then that after 10 weeks of unsuccessful trapping in the North Carolina mountains during the summer of 1964, I was haunted by the advice of my elders and my failure to heed it. My mood was a bit gloomy as I tramped through the curling mist and dripping underbrush on the slopes of Roan Mountain, checking a line of live traps set for this elusive and, as I was beginning to believe, perhaps nonexistent species. Peering through a patch of sodden rhododendron, I could see that my next trap was closed—another red squirrel, no doubt! To my surprise and initial bewilderment, I was greeted by something fluffy and gray, almost hamster-like in its hunched-up posture, with distinctive large eyes, gray belly, featherlike tail and gliding membranes. It was a northern flying squirrel! I caught another that day and several more in succeeding weeks, and these and squirrels from other parts of the United States became the nucleus of my behavioral research. In the process of trapping and handling these squirrels I somehow became "hooked" on them and their curious ways, and the study started when I was a student long ago has continued intermittently.

Flying squirrels have been the objects of great curiosity and some mystery since the time of America's early naturalists in the 18th century. They come out only at night, so few people see them or even suspect their existence. They cannot fly, in spite of their name, but the furred folds of skin running from wrist to ankle along their sides permit an impressive repertoire of gliding and parachuting maneuvers, ideal for escaping predators and crossing gaps between widely spaced trees. To the unobservant they resemble mice, and, if you don't care much for mice, the idea of a gliding, climbing, acrobatic mouse is indeed terrifying. The two species found in North Carolina are the



***Grasped gently** by a biologist, this northern flying squirrel sports its recently acquired ear tag. The squirrel will be released to help provide information on the long-term welfare of these high-mountain dwellers.*





only flying squirrels — in fact the only gliding mammals — found in the western hemisphere. The smaller southern flying squirrel weighs only a few ounces (50-75g), is usually gray with a brilliant white belly and possesses a short featherlike tail. This species occupies deciduous and mixed forests throughout the eastern United States and parts of Mexico. The northern flying squirrel is more robust: it is longer and heavier (95-145g), with a brownish-gray or reddish-gray back, a dull gray-white belly and a longer, thicker (but flat) tail.

While northern flying squirrels have an almost continuous distribution throughout the conifer and cool forests of Canada, the northern United States and parts of the Rocky Mountains, the distinctive subspecies of the southern Appalachians are rare and confined to high-elevation, isolated islands of forest composed of spruce, fir, beech, maple and birch. In fact these squirrel populations are remnants — animals marooned on mountain peaks by a warming climate and the retreat of the great glaciers of the last Ice Age, far to the north. And as the squirrels' habitats have shrunk during the past 10,000 years, so apparently have their populations and opportunities to colonize new forests. When I started my studies in the 1960s, little was known of the species as a whole and almost nothing about the subspecies of the eastern mountains. The northern flying squirrels of North Carolina and Tennessee were always rare during the 1960s, '70s and early '80s, were difficult to capture and invariably inhabited the remotest of areas. In 1985, out of concern for the vulnerability of these subspecies and their habitat, the U.S. Fish and Wildlife Service listed them as endangered. Shortly thereafter, I found myself drafted back into flying squirrel research.

Although the northern flying squirrel is a classic example of a difficult study animal, the increasingly intriguing picture of its way of life, as pieced together over three decades, and concern for its precarious status have spurred renewed interest in the past few years. While a number of biologists in West Virginia and Virginia study one of the Appalachian subspecies, a small group including Wildlife Resources Commission nongame biologist Alan Boynton, biologists Travis Knowles and Alan Smith and a number of other wildlife and forest researchers have joined me in an attempt to understand the distinctive subspecies living in the North Carolina - Tennessee mountains. With support from the N.C. Nongame and Endangered Wildlife Program and the U.S. Fish and Wildlife Service, we are attempting to obtain enough information on the ecology of this rare squirrel to permit the development of a long-range strategy for preserving it.

***Despite raw weather** and heavy snow, biologists check their route of squirrel boxes in likely habitat high in the mountains where hardwoods give way to fir forests.*

Dr. Peter Weigl *prepares to check a box in hopes it might contain a northern flying squirrel, one of North Carolina's least common mammals. Though numerous much farther north, these creatures survive in limited numbers at the southernmost limits of their range.*

One of the central questions we face is understanding the northern flying squirrel's habitat requirements and its apparent confinement to high-elevation forest. In the North Carolina mountains these squirrels are almost always associated with a mosaic of hardwood and conifer trees or the edge areas between the spruce-fir and the hardwood zones. They are never found in pure stands of conifers and only rarely in the hardwoods of lower elevations. Why the confinement to such a narrow band of habitat? Their nesting and food needs may partly account for such a preference.

Although these flying squirrels often use leaf and twig nests, in cold weather or while rearing young they seem to prefer cavities or hollows in trunks and branches. Most cavities are found in the ancient birches, beeches and maples of upland forests, and thus these old-growth areas become special resources for the squirrels. For a small, defenseless animal in a land of many predators and severe winters, a concealed cavity lined with finely chewed bark and moss is a necessity for survival. The squirrel's food habits may also dictate a mountain home. Once it was believed that these animals, like the southern flying squirrel, consumed and stored quantities of nuts and seeds. However, studies from all parts of the country now show that the northern flying

squirrel is primarily a fungus and lichen eater. While it may eat some seed, buds, flowers, insects and an occasional bird's egg, it usually depends on a wide variety of underground fungi—like the truffles famous in French cooking—and certain species of lichens that encrust the bark of trees. Many of these foods are closely associated with particular species of trees and special soil, moisture and temperature conditions, and thus their presence may partially account for the squirrel's residence in mountain habitats. Yet tree cavities, truffles and lichens are also available at lower elevations and in other forest types, and in the Northeast especially, northern flying squirrels are known to exploit these habitats. Why not in the South?

Another idea that has been advanced to explain their mountain confinement is related to their remnant status and the small size and isolation of their populations. Squirrels surviving in the shrinking patches of cool northern forest, so this argument goes, have become too few in number and too specialized genetically and ecologically to permit much expansion and downward migration. The population biology of these squirrels at least superficially supports this argument. Available data suggest that these squirrels have been exceedingly rare even in their best habitats over most of the past 25 years. Northern flying squirrels appear to have only a single litter of two to four young per year. Given the short lifespan and the high potential mortality of small mammals in general, they may be just barely holding their ground on the various peaks and ridges of the South.

Their degree of specialization and genetic uniformity awaits much-needed study, but there are some indications that the species is more plastic and opportunistic than was formerly believed. For reasons not yet clear, the squirrels in some sections of the Appalachians have undergone a minor population explosion in the last two years. In areas where three animals might have been trapped in two weeks of intensive work a few years ago, captures of six to 15 are now not unusual. Squirrels have recently been discovered at several new sites along ridges or on separate mountains—areas that never yielded animals in previous field surveys. Recent research in the north-

Tagged and checked, *a northern flying squirrel is released to return to its home in the treetops in North Carolina's mountains. Biologists believe one factor limiting this squirrel's range is aggressive competition from its close kin, the southern flying squirrel.*

***Studying the northern** flying squirrel is hard work, but if the species is to survive here, more needs to be learned about its habitat needs, favored foods and any factors that might be affecting its prosperity.*

western United States has shown a strong relationship between fungus abundance and the availability of deadwood, on which many fungi depend. In North Carolina, at least, one wonders if the vast forest die-off of the past decade, variously attributed to insect damage, drought and air pollution, has promoted a great temporary "bloom" of fungi and an increase in squirrel numbers as well. It could be possible then that northern flying squirrels can and do respond to such changing conditions with increases in range and population size. The occasional captures of specimens well below the spruce-fir zone in the Great Smoky Mountains and in Virginia also suggest some degree of mobility and adaptability.

If narrow habitat requirements, low numbers and lack of adaptability do not adequately explain the continued confinement of the northern flying squirrel to its mountain realm, what other factors might provide an explanation for this curious situation? What about other species of animals? We have no evidence that some super predator lurks on the lower slopes and in the dark valleys of the Appalachians waiting to devour itinerant northern flying squirrels. Many species of squirrels including the smaller, equally defenseless southern flying squirrel thrive in such areas. As for competitors, what other species could possibly make demands so similar to those of the northern species that its population expansion could be blocked? Perhaps the best candidate is its relative, the southern flying squirrel.

The southern flying squirrel is also nocturnal, uses the same types of nests and is known to eat at least a few of the same foods. Behavioral studies that I carried out many years ago revealed that southern flying squirrels were more active, aggressive and dominant when competing with the northern species for nesting sites. And, although the two species are occasionally found in the same or adjacent areas of woodland, they seem unable to coexist in successive years. In fact, our recent studies reveal that in some parts of the mountains the southern flying squirrel is beginning to show up on the upper slopes. In a few such areas that once supported northern flying squirrels, the latter is now rare or absent.

It is hard to believe that competition for nests and some foods alone might determine the range of the larger flying squirrel. Twenty-five years ago, I placed groups of both flying squirrel species in adjacent, large outdoor cages. The smaller lowland species thrived and reproduced; the larger mountain squirrels, after a few months, suddenly started to die, showing a baffling array of symptoms. Given the difficulty I had had trapping these rare squirrels, I was desperate to prevent further losses and thus sought the help of two veterinarians and a medical pathologist. It appeared that my captive southern flying squirrels—and almost all wild-caught animals I obtained subsequently—harbored a roundworm (nematode) parasite, which appeared to have little effect on their general health, behavior or reproduction. In contrast, northern flying squirrels newly captured in the mountains were never found to have this parasite, but captive animals that came in contact with the parasite by living in cages near the southern species became sick and often died unless moved into the protected conditions of the laboratory.

This observation and additional field and laboratory studies strongly raise the possibility that the southern flying squirrel possesses a biological weapon in the form of a parasite that, when passed on to the northern flying squirrel, might threaten its survival, weaken its competitive abilities and check its capacity to expand its range. Such an unusual relationship between two squirrel species needs further study, but it is at least consistent with a few similar examples in the wildlife literature and the pattern of population and range changes we have observed in the southern Appalachians.

Why would biologists spend time and energy to study such a little-known, essentially "worthless" animal? There is no pat answer to such a question. Basically our justification is grounded in both biology and conservation. Study of rare species often reveals a vast array of special adaptations, unusual biological phenomena and, more important, intriguing questions about organisms and environments. Such work can be risky but can also provide both the inspiration and satisfaction that a more "prudent" project often lacks. The relationship between the history and distribution of these flying squirrels, their strange food habits, their unusual population fluctuations and their possible victimization in biological warfare provides a basis for much thought and future research. At the same time, these squirrels present a conservation problem. They are part of our regional biota and natural heritage, and they seem to be exceedingly vulnerable to human and natural disturbances because of their low numbers and patchy distribution. They are long-term residents of the mountain forests, which are now dying off at an alarming rate. Understanding these squirrels may give us a better understanding of the natural system in which they live. One thing is clear: if we desire to preserve our natural world intact we need to learn all we can about it, and studying and protecting a lowly squirrel may be a good place to start.

Finally, why am I continuing to do research on such an animal? Well, because I am fascinated by both the animal and this kind of study. And if you have only one lifetime in which to work, you might as well try to do the things you enjoy. Some contrary people never change. ⊠

Beretta Has More Firepower, Better Accuracy

Commission Trades In Revolvers for Semi-autos

Written and Edited by Vic Venters

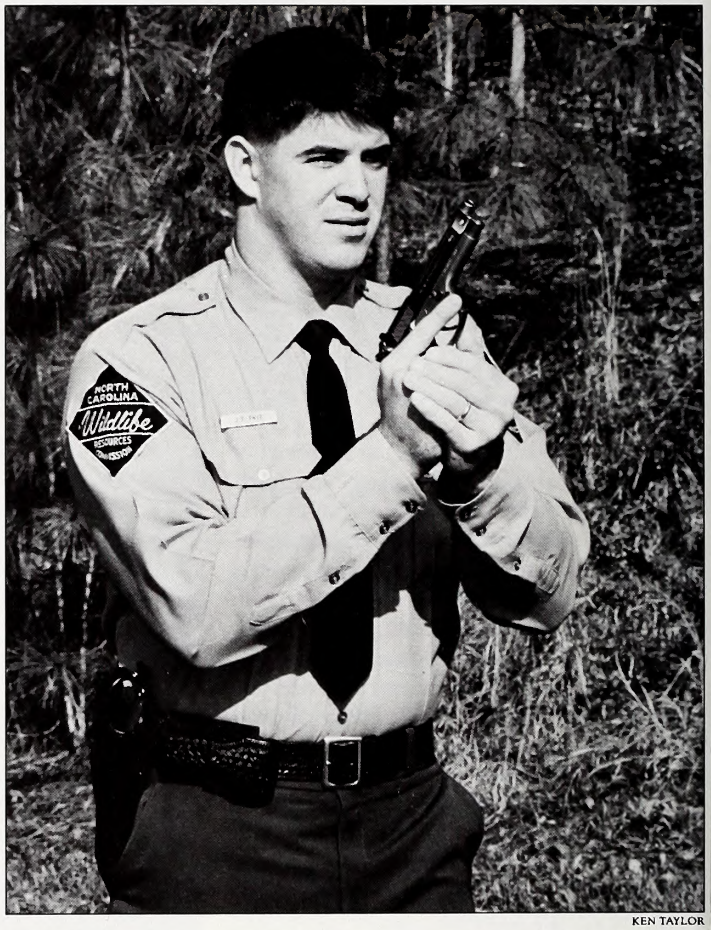
Been checked by a Wildlife Commission enforcement officer lately? If so, you might have noticed something new. This past December, the Commission's enforcement officers traded in their old Smith and Wesson 686 .357 magnum revolvers for new Beretta 92-F semi-automatic 9-millimeter pistols.

The Commission's move to the Beretta is part of a continuing trend by law enforcement agencies to abandon revolvers for semi-automatic pistols. "We are running into more drug traffickers and people who are better armed," said Captain Wilton Pate of the Commission's Division of Enforcement. "The 9 millimeter gives us a lot better firepower and a lot more accuracy."

Make no mistake, wildlife enforcement can be dangerous work. Statistically, wildlife enforcement officers are about six times as likely to be assaulted as are other law enforcement officers. Also, many suspects that wildlife enforcement officers check are armed and are often in remote settings, where officers are far away from backup help should trouble arise.

Instead of the revolver's six cartridges, the Beretta holds 16 shots — 15 in the magazine and one in the chamber. The Commission's new pistols also feature luminescent night sights and a special Teflon-coated nickel finish. "The finish on the Berettas is one of the most rust resistant made, and these night sights are one of the most desirable features that any law enforcement weapon could have," Pate explained, adding that since converting to the semi-autos, Commission officers have shown tremendous increases in their ability to place shots on target in low-light situations.

The Wildlife Commission joins the U.S. military, the North Carolina State Highway Patrol and numerous local and state law enforcement agencies in selecting the Beretta for its sidearm. "We tested the Beretta against other available 9 millimeters and we found it to be the most reliable and best suited for law enforcement," Pate explained.



KEN TAYLOR

Brand New Berettas: *A wildlife enforcement officer tries his hand with the Commission's new Beretta 92-F semi-automatic pistol. Officers traded in their old .357 magnum revolvers for the 9 millimeter this winter. The new pistol offers Commission enforcement officers more firepower with better accuracy.*

A Change of Colors

In December's article "The Battle for the Roanoke Refuge" the map colors showing state and federal refuge areas should have been reversed. We regret any confusion this might have caused our readers.

Save Our Streambanks

Booklet Has Solution to Erosion Pollution

Whether you live in the mountains, on the coast, or at any point in between, you don't have to go far to find soil erosion around our streams and rivers. Increasing development, agriculture and road-building practices are all contributing to erosion and taking a toll on the health of our waterways. Erosion can deposit high levels of sediment in streams, which can kill fish and aquatic organisms, suffocate spawning beds and carry chemicals and pesticides from agricultural areas into fragile aquatic ecosystems.

To help citizens protect streams from erosion, the Izaak Walton League of America has produced a booklet, "Save Our Streambanks: A Survey of Methods." The booklet explains simple methods for preventing soil erosion and saving fish and wildlife habitat.

To order the booklet, send $1 to Izaak Walton League of America, Save Our Streams, 1401 Wilson Boulevard, Level B, Arlington, VA 22209.

Reasons for Regulations

Proposed Regulations Affect Freshwater, Saltwater Limits

Have you ever wondered why certain hunting or fishing regulations change from year to year? Often the answers are obvious, with regulations designed to relate to specific rising or falling wildlife populations.

Other times, the reasons behind regulation changes aren't so apparent to the general public. With the fishing season only a snowfall or two away, we asked Fred Harris, the chief of the Wildlife Resources Commission's Division of Inland Fisheries, to explain some of the proposed regulation changes that may affect sportsmen this year. Listed below are some of the proposed changes, along with Harris's comments following each proposal.

—Delete the Ararat River in Surry County from the designated public mountain trout waters classification. "*This trout water is on private land and it's being closed due to landowner's request.*"

—Delete from designated trout waters classification five miles of the Nantahala River, from Roaring Fork to Nantahala Lake in Macon and Clay counties. "*This portion of the Nantahala is passing from U.S. Forest Service control to private hands.*"

—Designate flounder and red drum as gamefish in inland waters and set minimum size limits of 13 inches for flounder and 14 inches for red drum. "*The limits we propose would be consistent with the limits the Division of Marine Fisheries already has in coastal waters. Due to heavy fishing pressure, we need to protect the stocks of the younger fish.*"

— Set a minimum size limit of 12 inches for spotted sea trout in inland waters. "*This also follows the limits set by the Division of Marine Fisheries and reflects the need to protect the smaller fish.*"

—Remove the daily limit for chain pickerel in Kerr and Gaston lakes and tributaries. "*There is no creel limit in other state waters. This was an agreement with Virginia to make the limits the same as in other North Carolina waters.*"

—Increase the daily creel limit for white bass to 25 on Gaston and Kerr lakes. "*We are not interested in having a large white bass population in Kerr lake. We don't want the white bass hybridizing with striped bass.*"

—Set a 14-inch minimum size limit for largemouth bass in Currituck Sound and the North River. "*After heavy rains last year, Currituck Sound has just returned to lower salinity levels. The bass spawned there last spring and we also stocked 60,000 fingerling bass. This size limit should protect the bass until they reach spawning age, and this should help restore the sound's fishery.*"

—Prohibit the harvest of striped bass between 22 and 27 inches in length from April 1 to May 31 in coastal rivers and tributaries up to the first impoundment. During that time, set a four-fish daily limit for striped bass. "*This regulation would direct the harvest of striped bass toward male fish. In this protected-slot size, there are a lot of female fish and we need to protect them.*"

—Remove the minimum size limit for spotted bass in the W. Kerr Scott Reservoir. "*In Kerr Scott, spotted bass just don't grow very big. They grow very slowly and many spotted bass die before they reach legal size. This should allow fishermen to harvest some of these fish.*"

—Set a regulation allowing property owners adjacent to inland waters to set up two crab pots attached to their pier or property. "*This will not harm fish populations and will allow people to harvest the crab resource.*"

—Require all fixed gill nets to have a name tag attached with the owner's name and address legibly inscribed. "*This should allow enforcement officers to identify the owners should the need arise.*"

The public is invited to comment on any of the proposed regulations at upcoming public hearings on hunting, fishing and trapping regulation changes. See *Field Notes* for public hearing locations.

Calendar Of Events

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before travelling to an event. Listings for the calendar should be sent at least four months in advance.

Feb. 16-18
The Southeastern Wildlife Exposition in Charleston, S.C., will feature wildlife paintings, prints, carvings and collectables. For more information contact Southeastern Wildlife Exposition, Dept. G, P.O. Box 20159, Charleston, S.C. 29413-0159, or call (803) 723-1748.

March 2-4
The Dixie Deer Classic at the N.C. State Fairgrounds in Raleigh features hunting and sporting equipment, seminars, outfitters, taxidermists and taxidermy exhibits. For more information contact Dixie Deer Classic, Wake County Wildlife Club, P.O. Box 12202, Raleigh, N.C. 27605, or call (919) 833-5550.

Reader Busts Bivalve, Frees Bird

Although a howling Northeaster was October's way of bidding the Cape Fear Region farewell, the month's last weekend offered moderate temperatures and the opportunity for my friend Rodney Trivette of High Point and myself to say "hello" (hopefully) to the local puppy drum population.

As we entered the maze of tidal creeks near the mouth of the Cape Fear River, I hugged the marshgrass-covered shoreline to avoid a shoal. There I noticed a snowy egret to the starboard side beating its wings in frustration as it tried to fly from atop a rock. I expected to find this once-graceful bird entangled in a six-pack container or similar man-made material.

To our surprise, however, we found a large clam clamped down tightly on the egret's left foot! A quick rap on the clam with some pliers from my tackle box cracked the clam and freed its unlikely hostage.

Joseph D. Nicholson
Carolina Beach, NC

February Good Time to Build Bluebird Boxes

Bluebirds Benefit from Box Building, Nest Monitoring

If February's weather has limited your outdoor activities to an occasional foray to the woodpile, consider building a nesting box for a bluebird. In a month or so, you could be a proud foster parent of one of the state's most popular songbirds. While February doesn't have many "bluebird days," it is an excellent month to begin putting up new nesting boxes and looking for suitable bluebird habitat.

Bluebirds are one of the easiest wildlife species for the average citizen to help. While bluebird populations crashed about 90 percent over the last century, in the past couple of decades bluebird populations have responded tremendously to nest-building by concerned bird-watchers and bluebird fanciers.

Normally, bluebirds nest in cavities such as those found in dead trees or the tops of wooden fenceposts. However, as habitat alteration has eliminated many of these traditional nesting spaces, bluebirds have come to rely more on man-made boxes for nests.

North Carolina has both a resident, nonmigratory bluebird population and a migrant population that usually arrives from the North. In mid-February, bluebirds return to breeding areas, and by the first of April they begin nesting. Bluebirds can be prolific, raising up to three broods in their nesting season between April and August.

Bluebird boxes should be placed facing open areas such as large lawns, pastures or golf courses. The North Carolina Bluebird Society, which has about 400 members, can provide more detailed information, finished boxes and plans for building boxes. The Bluebird Society is also looking for new members and volunteers to participate in its annual spring breeding survey to monitor the progress of bluebird nesting success. For more information, write the North Carolina Bluebird Society, P.O. Box 4191, Greensboro, N.C. 27404, or call J.W. Busick at (919) 584-5137.

JACK DERMID

Box O' Bluebirds: *February is an excellent time to begin placing bluebird nesting boxes for the upcoming breeding season. Boxes are easy to build and have helped bluebird populations recover from decades of decline. Bluebirds like to nest around large open areas such as meadows and large lawns.*

Field Notes

Season openings or closings this month:

Rabbit	Closes Feb. 28
Bobwhite quail	Closes Feb. 28
Ruffed grouse	Closes Feb. 28
Eastern raccoon and opossum	Closes Feb. 28
Snipe	Closes Feb. 28

Public hearings for the 1990-91 hunting, trapping and fishing regulations listed below. All hearings begin at 7:00 p.m. and the schedule is as follows:

Date	District	Location
Feb. 5	1	Edenton, Swain Auditorium
Feb. 6	2	New Bern Courthouse
Feb. 7	3	Nashville Courthouse
Feb. 8	4	Elizabethtown Courthouse
Feb. 9	5	Graham Courthouse
Feb. 12	9	Hendersonville Courthouse
Feb. 13	8	Morganton Civic Center Auditorium
Feb. 14	7	Elkin High School
Feb. 15	6	Albemarle, North Stanly High School

Registration Office Swamped in Summer

Register Your Boat Early, Prevent Delays

If you wait until June to register your boat, chances are you'll lose some valuable fishing time. During June, the registration process may take from three to four weeks as opposed to the normal two weeks. During the busy season for registration between March and August, June is the peak month for applications.

"Everyone seems to wait for warm weather before they think about registering their boats," said Helen Gournas, supervisor of the Commission's boat registration section. "Although we hire part-time help during this time, we're often swamped by then. You should register as soon as possible."

North Carolina law requires any boat that uses a motor—including electric motors—and sailboats over 14 feet to be registered. Boats may be registered every one or three years. While new registrations, transfers and other transactions must be handled out of the Raleigh office, renewal registrations can be done by any of the 215 registration agents located throughout the state. "Simply take your blue, three-part renewal card to these agents and the renewal can be handled on the spot."

Renewal forms are sent out one month before the expiration date of the registration. A prompt return of the form will prevent you from losing time on the water. Be sure your application is complete and the proper fee is enclosed, Gournas added.

For more information, consult your North Carolina Boat Owner's Guide (issued with registration) or call the Commission's Boat Registration Section at (919) 733-7380. Please have complete information and a pen and paper handy.

MELISSA McGAW

Number It Now: *If you don't want to be wasting time come fishing season, consider registering your boat as soon as possible. That way, you'll beat any delays caused by the registration rush this summer. Registration is mandatory for all motorized boats over 14 feet in North Carolina.*

Magazine Rates Rise

It's been 11 years since we had to do this, but rising costs have finally forced us to raise the subscription price for *Wildlife in North Carolina.* With this February issue, the price of a one-year subscription to the magazine will increase from $5 per year to $7.50 per year. The price of a three-year subscription will increase to $20 from $12 for the period. The good news is that lifetime subscriptions remain at the same bargain-basement prices—only $100 for a lifetime of enjoyment!

This is the magazine's first price hike since 1979.

Subscription orders postmarked no later than Jan. 31, 1990, will be honored at the old rate. Subscribers who received subscription-renewal notices through the end of December also received a notice to renew at the old prices. With the exception of price increases, the subscription forms for *Wildlife in North Carolina* will remain the same.

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Status on November 30, 1989

	Numbers Sold	Revenue Received
Lifetime Sportsman's License	48,330	$17,577,893.43
Lifetime Hunting License	588	161,056.74
Lifetime Fishing License	3,729	829,167.17
Lifetime Subscriptions to Wildlife in N.C.	1,771	242,161.04
Contributions	—	160,576.15
Fund Total	54,418	$18,970,854.53
Total Interest Earned	$5,006,799.49	

Rare, Endangered Species Should Benefit

License Needed to Collect Reptiles

Last year, the North Carolina mountains were invaded by some unscrupulous reptile collectors, who proceeded to remove 25 to 30 endangered bog turtles from some of the state's most important mountain bog sites. The collectors severely disrupted a research project that had accumulated 15 years' data on individual turtles' growth, reproductive habits and movement patterns. Moreover, most bog turtle populations are small and simply cannot withstand intensive collecting pressure.

This year, anyone in North Carolina who plans to collect reptiles or amphibians must first obtain a collecting license from the Wildlife Resources Commission. The Commission's Division of Wildlife Management will issue the licenses for a $5 fee. However, a license will not be required if fewer than five reptiles or 25 amphibians are collected and possessed provided that none of these are species listed as endangered, threatened or of special concern.

"This is an effort to restrict the harvest of rare species such as the green salamander and the bog turtle, which are protected species found in the North Carolina mountains," said Randall C. Wilson, manager of the Commission's Nongame and Endangered Species Program. "It's also an effort to monitor the commercial harvest of other species which may soon be protected under the state's endangered species laws."

Applications for the license can be obtained from the Commission's Division of Wildlife Management. License holders will be required to file an annual report stating how many reptiles or amphibians they collected.

Death before Dismemberment!

Reader Urges Frog Giggers to Aim True

Dear Editors:

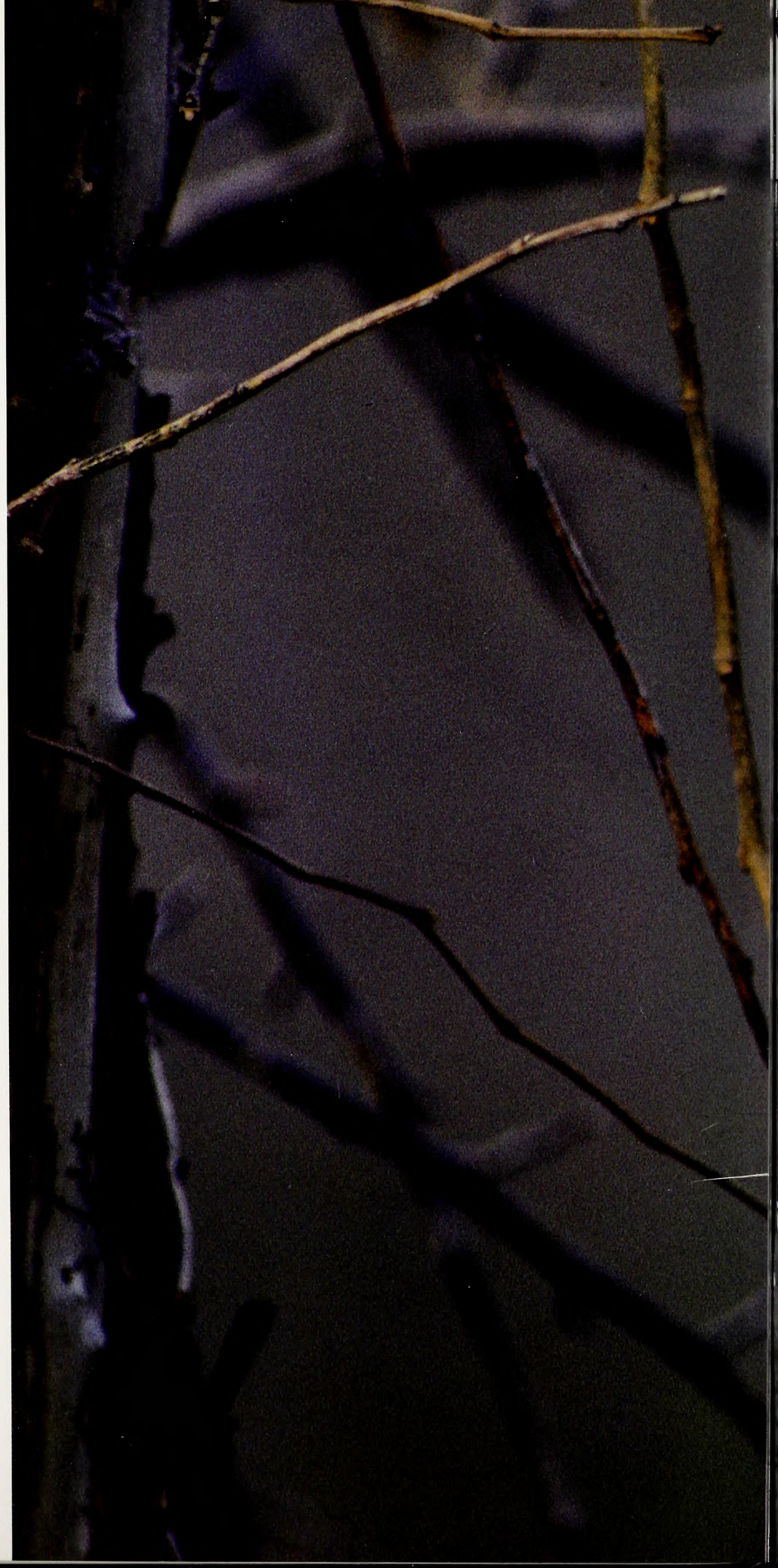
Frog legs are good eating. They taste like chicken or squirrel, only better. I first discovered this gourmet delight in a restaurant in New York in the 1960s. Upon moving to North Carolina, I was ecstatic to find frog legs on the menus of several establishments where I've dined.

Although I enjoy frog legs, I began to ponder the source of these goodies. I've learned that people gig for the amphibians. Only the legs are edible, and some frog hunters tell me they break off or cut off the legs and throw out the rest of the body, even if the frog is still alive. I was appalled to learn this.

I have no quarrel with the use of meat for the table. However, I would prevail upon those practicing such inhumane methods to give some thought to first killing the frog, and then dressing it. Be a good marksman when you go after frogs and obtain your catch with a clear conscience.

Marie Hardin Melville
Wilmington, N.C.

The Eastern Box Turtle is a nongame species. For more information on nongame species and the Nongame and Endangered Wildlife Fund, see the article on northern flying squirrels on page 22.



Home Sweet Hole

It may look like a lot of work for this flicker to hammer out a home in this tree, but at least there are no building permits required, no subcontractors, no cost overruns and no mortgage.

LITHOGRAPHY BY EDWARDS & BROUGHTON COMPANY, RALEIGH, NORTH CAROLINA

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WILDLIFE IN NORTH CAROLINA

MARCH 1990 75 CENTS

How To Age A Deer And Other Stuff

by Jim Dean

Occasionally, we receive calls or letters from readers who are confused about various biological terms and other technical jargon appearing in the magazine. Indeed, just this past week, someone actually used the term "mumbo-jumbo" to describe something we had published. Naturally, we were flattered. It's true, however, that obscure terms may give rise to legitimate questions. Furthermore, there are times when readers simply ask us fascinating questions right out of the blue with no provocation on our part. Therefore, we offer the following answers to questions asked us most frequently, or at least once.

ILLUSTRATION BY JACKIE PITTMAN

Q–One often hears game biologists speak of "aging" a deer, or some other animal. How is this done?

A–The best way to age a deer is to soak it in very strong tea much as you would a document you wished to antique. While this does not actually age the deer, it gives it a nice patina.

Q–What do wildlife enforcement officers mean when they say an animal has been "reduced to possession?"

A–As you might imagine, it is very difficult to possess some animals, especially large ones. You simply can't keep a hippopotamus in a bird cage. It is therefore advisable to first reduce it in some way. This is customarily accomplished through dietary manipulations, but liposuction holds much promise.

Q–Recently, I read in your magazine that the origin of the word raccoon came from *aracun*, the word Indians used for this creature. Can you explain more fully?

A–We just made that up because it sounded better than the truth which is that someone once asked an Indian what he called the creature, and caught off guard by the question, he stammered, "Er, uh, coon."

Q–As a newcomer to quail hunting, I have been reading as much as possible about the hallowed traditions of this fine sport. Authors constantly refer to working their dogs, or getting good dog work. What do they mean?

A–This is a myth perpetuated by hunters. Dog work is an oxymoron, meaning the words "dog" and "work" are mutually exclusive. Another example of an oxymoron is "military intelligence."

Q–I am a student in Mrs. Grunch's fourth grade, and I have a term paper due tomorrow on wildlife. Can you help me?

A–Happy to. Tell Mrs. Grunch that your term paper was eaten by timber wolves while you were walking to school. If there are no timber wolves in your neighborhood, contact the endangered species specialists of the Wildlife Resources Commission, and they will see that some are stocked.

Q–You guys are always writing about habitat, and the dangers to wildlife of losing it. Why use such big words? Just call it homes for wildlife.

A–You're just not reading carefully. Whenever we use the word habitat, we're talking about a feline sub-species known as *Sylvestris tweetyeatem*. If you watch television, you should be familiar with the famous quote from the biologist who first identified this fearsome creature, "I taut I taw a habitat."

Q–What's all this doomsday drivel about the "greenhouse effect?" Do you really think the climate will warm and the sea levels rise?

A–All we know is that a condo development called Oceanview is currently under construction at Kinston. The brochure says homeowners will be able to surf fish from their porches. A discount is being offered to those who commit early.

Q–Recently I saw a bumper sticker that said "Support Your Right To Bare Arms." As a nudist, I protest that we should be allowed to bare our buns as well. Would you support this cause?

A–We would, except that you obviously misread the bumper sticker. Had you taken a closer look, you'd have seen that it said "Support Your Right To Arm Bears."

Q–All my life, I have called them Canadian geese, and now you say the correct term is Canada geese. What gives?

A–It's simple. All your life, you've been wrong. You don't buy Viennese sausages in a country store, do you?

Q–In an article you published years ago, there was a comment that many serious upland gamebird hunters cook woodcock virtually whole, and eat them trail and all. What is a woodcock trail?

A–A woodcock trail is a well-worn path followed by a woodcock, and why anybody would want to eat trodden mud, dead leaves and twigs is a mystery to us.

Q–I have just plunked down $17.99 for a box of nontoxic shot. Why does shot have to be nontoxic?

A–The use of nontoxic shot is mandated by the Federal Food and Drug Act because young children might pry open a bunch of, say, 12-gauge, 3-inch magnums and swallow a pound of No. 4 shot. Next season, we are reliably informed, each shotshell will come in a more handy capsule form.

Q–Many of your wildlife management articles discuss harvest. I thought this was an agricultural term.

A–It is. Wildlife species like rabbits are planted each spring by biologists, and that is why rabbits are harvested by hunting. No doubt, if you look closely the next time you're in the woods, you may see some rabbit seeds which are round, dark brown balls about the size of a raisin.

March 1990
Volume 54, Number 3

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Back Of The Book *by Vic Venters*

Cover *This just-hatched loggerhead turtle, a threatened species, heads for the open sea through the backwash of a wave. Photograph by Ken Taylor.*

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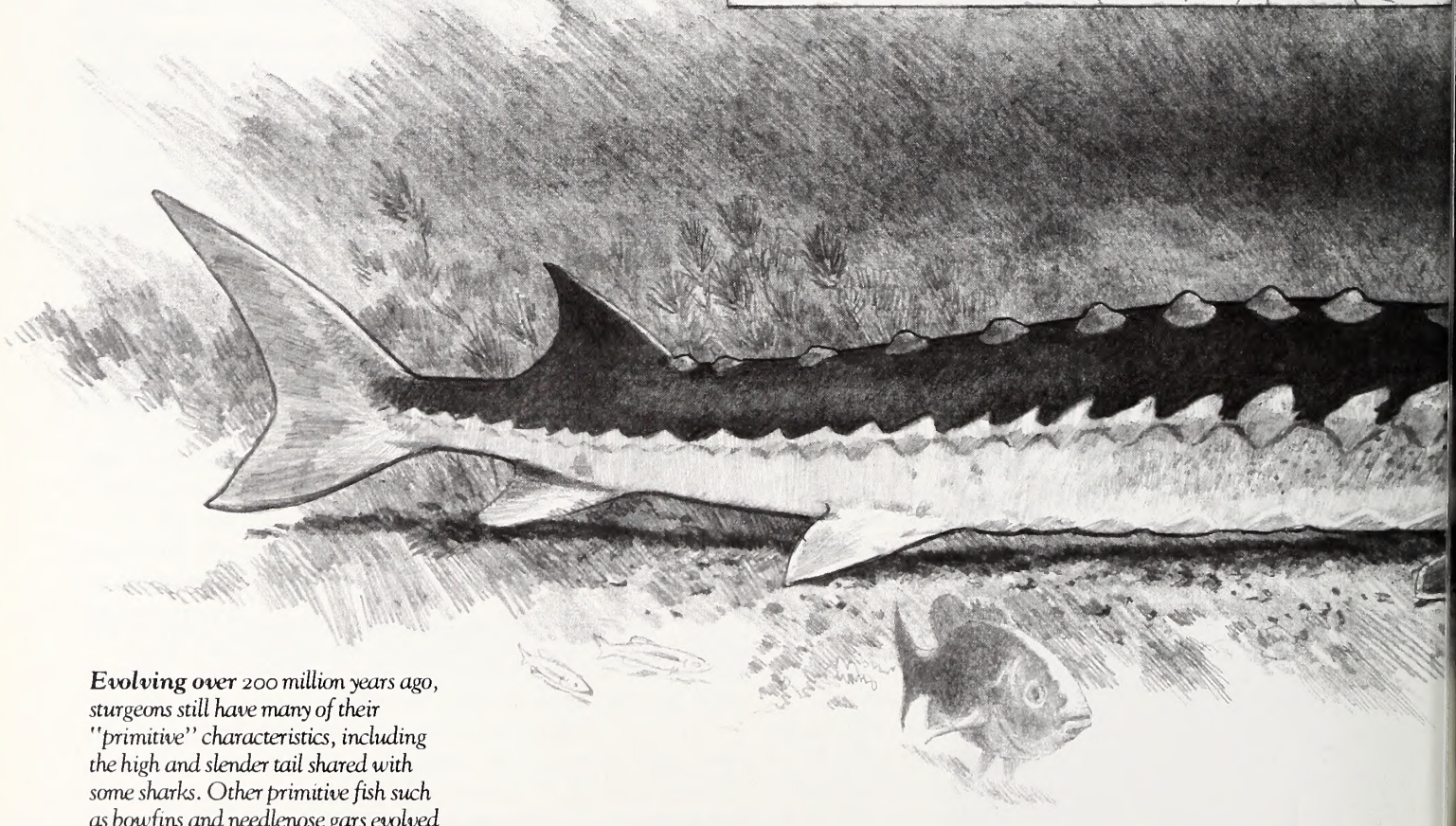
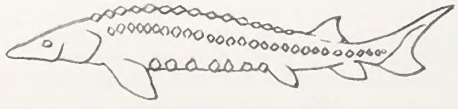
Worldwide, about 25 *sturgeon species are distributed throughout the northern hemisphere and nowhere else. The Atlantic sturgeon ranges from Labrador to Florida.*

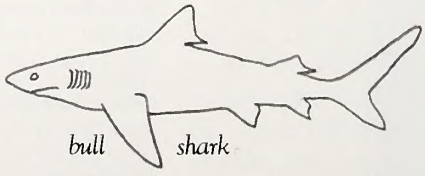
Armored with *large bony plates and scales, the Atlantic sturgeon (*Acipenser Oxyrhynchus*) is a living fossil that has grown less common in North Carolina. It is an anadromous fish, meaning it spawns in fresh water but grows mostly in salt water. Spawning sturgeon begin to run up eastern rivers beginning in late March.*



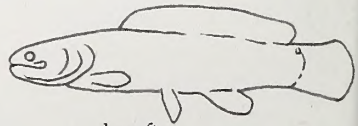
Evolving over 200 *million years ago, sturgeons still have many of their "primitive" characteristics, including the high and slender tail shared with some sharks. Other primitive fish such as bowfins and needlenose gars evolved more rounded tails.*



Atlantic sturgeon



bull shark

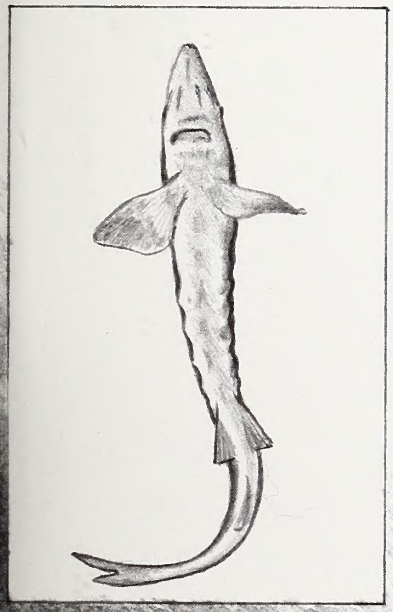


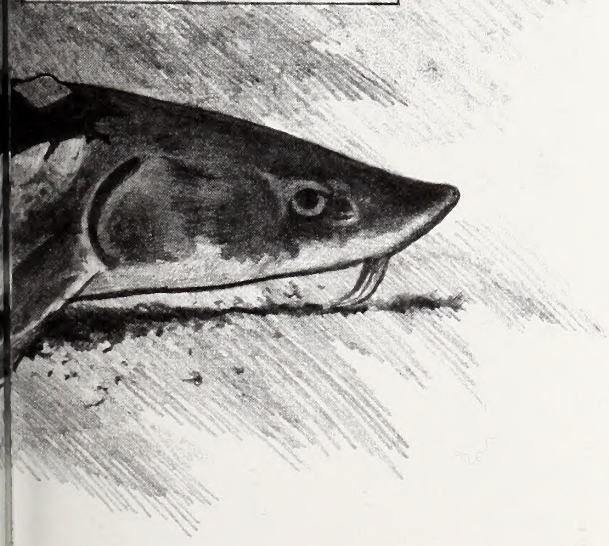
bowfin

Monster Fish

written by Lawrence S. Earley / illustrated by David Williams

***Sturgeon are** bottom-feeding fish with mouths positioned like suckers. In fresh water they like to eat plants and tiny animals such as mayfly larvae, mollusks and crustaceans. In salt water their diet includes shrimp and small fishes.*





If you're on the Cape Fear River later this month, you may be startled by the sight of a broad, black back emerging from the water and falling forward. It might sound like someone threw a log into the river. A fish? The thing is so big it's hard to believe that it could be a fish. Is it a whale that's been trapped in inland waters? Perhaps a rare visit of a manatee?

Most likely it's a sturgeon — more accurately the Atlantic sturgeon (*Acipenser oxyrhynchus*). It's by far North Carolina's largest inland fish, reaching sizes of 12 feet in length in the past and sometimes weighing over 500 pounds. Little wonder that some have called it "The Monster Fish of American Rivers."

The sturgeon is among two groups of fish that migrate between fresh and salt water to spawn. "Anadromous" fish move from the sea to spawn in fresh water; "catadromous" fish migrate from fresh water to the sea to spawn. It's an unusual "strategy" among fish, as only 1 percent of the world's fish species can move between salt- and freshwater systems.

The anadromous instinct occurs most frequently and consistently in certain primitive fish, of which sturgeons are a representative line. Indeed the sturgeon evolved in the archaic seas of 200 million years ago and has retained its ancient looks. While more "advanced" lines of fish developed small, overlapping scales that made it easier to move, the sturgeon (like the gar and the bowfin) looks a lot like an armored car. With its five rows of bony plates down its body and small bony plates covering its head, it bristles with metallic-like shields. Another "primitive" characteristic is its shark-like tail fin. Near its mouth it grows mustache-like barbels, or feelers, that make it look like an overfed cousin to the catfish.

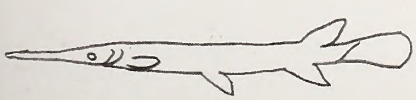
Adult sturgeons begin their spawning run in late March and continue through April and May, favoring broad coastal rivers like the Cape Fear, the Tar, the Roanoke and the Chowan. A female may hold up to 2½ million eggs, which when released attach to aquatic plants and stones. In a week to two weeks, the eggs hatch, and for as many as six years the young sturgeons will remain in the rivers, eating plants, worms and insect larvae from the river bottom.

But following their ancient instincts, in time they migrate to coastal waters and out to the continental shelf, where they will remain for many years. Here their diets run to small crustaceans, shrimp, mollusks and small fish. But then one spring, feeling restless, they leave their saltwater home and move up the coastal rivers to lay their eggs, returning to the sea in the fall. Females may not spawn again for three to five years; males may spawn every year or as seldom as one out of every five years.

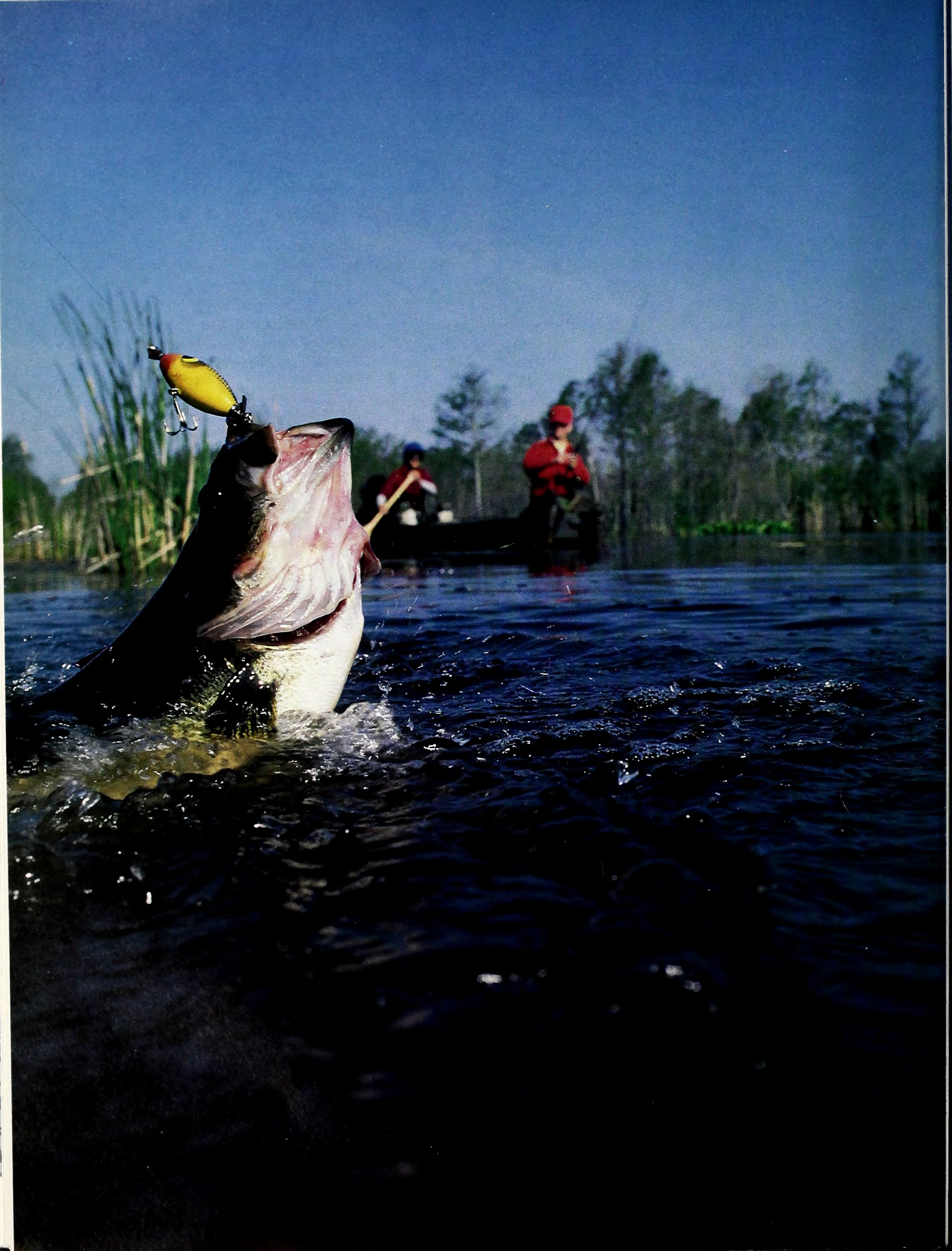
Sturgeons become sexually mature at anywhere from 7 to 27 years old, depending on their sex and the temperature of the water. They can live until they're 60, making them one of the longest-living fishes known.

The Atlantic sturgeon is one of seven U.S. sturgeon species — there are perhaps 25 worldwide. It was once one of North Carolina's chief commercial fishes, but by 1900 it and its smaller cousin, the endangered shortnose sturgeon, were overfished throughout their range, from Labrador to Florida. Its populations plummeted. While not endangered today, sturgeon populations are low and the fish are mostly small. They are still valued for their eggs, or roe, which make a high grade of caviar.

The monster fish hangs on in a sort of twilight of its long history, a reminder of teeming, ancient seas and their gargantuan life-forms.



needlenose gar



IN THE MOOD FOR BASS

written and photographed by Eugene Hester

Fishermen aren't the only impatient creatures this time of year. Bass are also on the move and in the mood.

Like fishermen, bass seem to suffer from their own version of "cabin fever" every spring. For one thing, they are emerging from a long winter of relative inactivity in cold water, and they're hungry. They're so hungry, in fact, they'll eat just about anything from minnows, frogs, worms and crayfish to leeches, insects, salamanders and baby muskrats. If it swims, hops or crawls, it's fair game for bass in the spring.

As if that weren't enough, spring is also the spawning time for bass, and this greatly influences their behavior. If you understand what bass are likely to do this time of year, you'll have a better chance of catching them. Certainly, some of my most memorable fishing has taken place in the spring.

Two years ago, I landed a beautiful 6-pound bass on a Hula Popper at a stumpy point near a boat ramp. On two earlier trips, a fish had followed my lure twice at that spot without striking, but on this day, the slow, erratic retrieve of that Hula Popper had not been ignored. Then, there was that trip last spring when several of us found the bass congregating in knee-deep water and caught and released dozens on surface lures.

***Warming water in** spring causes bass to begin to move into the shallows to look for places to spawn, and that's when topwater lures become increasingly effective. There may be no bigger angling thrill than when a fat largemouth strikes a floating lure.*

To enjoy such good spring bass fishing, I think it helps to divide the season into four parts—four somewhat different moods of bass activity. Since the locations of bass and their activities are different in each of these periods, you must vary your techniques.

The first period is late winter and very early spring, and I call it "waking from winter." The bass are just emerging from months of minimal activity in deep cold water. As the water begins to warm a few degrees, they become more active and begin their prowl. They make excursions from the deep water, not yet moving into shallow water but roving in moderately deep water parallel to shore. In clear water you can sometimes see the bass if you look closely, especially when you're wearing polarizing glasses to cut surface glare. They may be swimming deep and slowly. Any surface activity will easily spook bass in clear water so minimizing motion and noise are especially important.

During this period the bass will often travel in schools, and it is not uncommon to see more than a half dozen bass in a loose group. Sometimes there will be one or two big bass and several smaller ones.

Since the water is still cold and the bass have not yet moved to the surface or to shallow water, to catch them you need to fish deep away from shore. Because the bass are still sluggish, lures need to be

Fishermen aren't the only impatient creatures this time of year. Bass are also on the move, and in the mood.

worked slowly. Diving crankbaits and spinnerbaits are good, and weighted plastic worms will work.

If the water is very cold, the winter technique of bouncing a jig on or near the bottom can be especially effective. A jig with a pork frog added is even better. Some fishermen successfully use a Johnson spoon or a Hopkins lure jigged vertically.

Work the lures slowly 5 to 10 feet or more below the surface. Pause frequently during the retrieve. Give the bass time to look the lure over and decide to take it. During the pause, twitch the lure without moving it forward, before continuing the retrieve. With a little practice, by twitching your rod tip with a tight line you can make the lure do an enticing underwater dance during this pause.

Work your lure especially around drop-offs, where the depth quickly changes. An old river channel running close to the shore is an ideal location. From a boat between the channel and shore, it may be possible to fish in water from 5 to 30 or more feet deep. You can experiment by fishing at different depths to determine the depth the bass are holding. A fish locator can be especially helpful in finding these old river channels or other drop-offs.

When you find the right depth and work your lure at the right speed, you are likely to get a strike. Then you can stay with that combination of depth and speed to see if other bass will strike.

At this time of year bass, though wary, are likely to be actively feeding to restore reserves lost during the winter and to get ready for the rigors of the upcoming spawning season.

The second period of spring bass activity occurs just before the bass begin spawning activity. The spawning urge is strong and, as their reproductive hormones increase, bass actively search for nesting sites and then for mates. It is an especially active time for bass.

Their mood becomes more bold and aggressive as they move into shallow water and search out a suitable site for nest preparation. Often the nest will be in water only a foot or two in depth, though in some lakes it may be several feet deep. Like other members of the sunfish family (largemouth bass are in this family, along with bluegills, warmouths, crappies and others), a bass will sweep a saucer-shaped depression in the lake bottom for a nest. The nests of bass are solitary and often are not as completely saucer shaped as a bluegill nest. Sometimes they are simply a cleared spot on the shallow lake bottom near shore and often are on a firm substrate such as a large rock where the bottom is firm enough for eggs to attach without sinking in silt or other debris that could cover and suffocate the eggs.

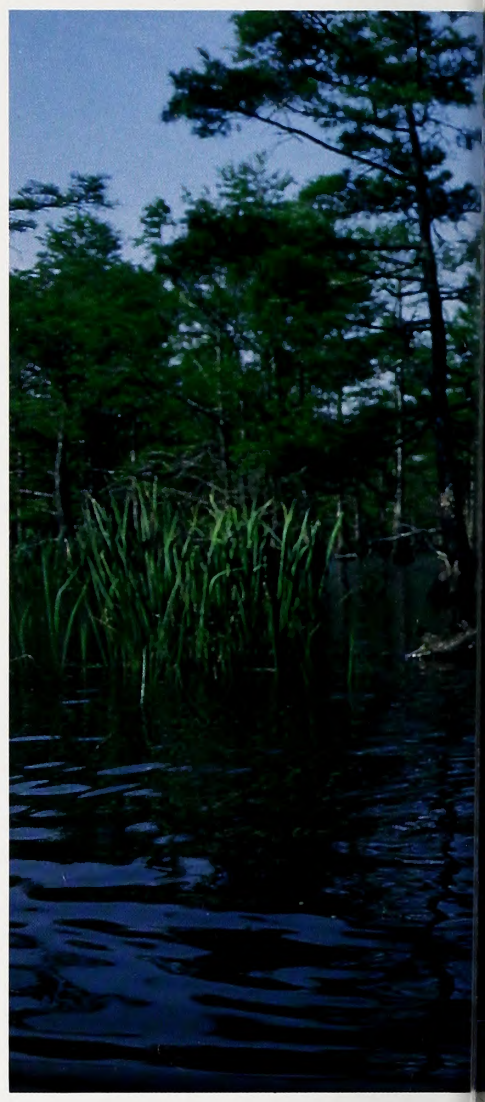
Usually this pre-spawning activity is in full swing in April, but it varies with the weather from year to year. It also varies in different parts of the state. Coastal waters may be two or three weeks ahead of mountain lakes.

In this pre-spawning period, bass fishing can be outstanding. The bass are in shallow warm water and ready to attack any intruder aggressively, including fishing lures. There is no better bass fishing than working the shallow edges of a lake or pond with a noisy surface lure on a warm spring day.

A bass boat or johnboat works great, especially when fishing along a steep bank. Maneuvering the boat slowly with a trolling motor can put you in the right position to cast to the most productive spots. Even so, when the water is uniformly shallow with a relatively firm bottom, wading is my favorite way to fish. I put on a pair of waders and a fisherman's flotation fishing vest and walk around slowly in water 2 to 3 feet deep. If there are deep holes, I use a belly boat made with a modified truck inner tube for flotation to keep from dropping in over my waders.

A belly boat gave me my best bass fishing day ever. It was early May and we had located the bass in shallow water. We waded in among the trees and weeds and cast surface lures—my favorite is a 3/8-ounce yellow Devil's Horse with black stripes. We also used a Hula Popper and a floating Rebel fished as a top-water lure by twitching and moving it slowly so it stayed on the surface.

***Deeper running** lures usually work better in early spring, but floating-diving minnow imitations are a favorite in mid to late spring because they cover a lot of water quickly and can be fished either on the surface or retrieved at depths of 2 to 3 feet.*



All three of these lures were deadly, and I remember catching and releasing 42 bass that day. All of them were fat, sassy and a beautiful greenish-black color, and they weighed 1 to 5 pounds.

Because bass during this period of their spring cycle are preparing to spawn, it is doubly important to release them in good condition. That way they can proceed with their spawning and also be available to be caught again another day.

The third period of spring bass activity is the one in which the bass are actively spawning. Carl Thorne of Raleigh called this period "Dead on the Bed." At this time, a bass's total interest is on spawning and subsequently caring for the eggs, and it refuses to be diverted from this activity.

This time is frustrating for many fishermen because they can see the bass swimming in circles in the same spot, often with part of a fin or the tail briefly out of the water, yet the fish will ignore lures cast to that spot. If the bass does get agitated and strike at the lure, it will usually strike

The author *divides spring bass fishing into four periods, adapting techniques to fish each one. During the later periods, wading the shallows can be especially effective as Bill Hinnant shows with this nice catch.*

several inches behind the lure but intentionally not take it. Sometimes a spawning bass will hit the lure, knocking it several inches into the air as if it intended to scare it away but making no attempt to swallow it.

Fishermen frustrated at finding bass only to have them ignore their lures will cast a minnow, crayfish, salamander, nightcrawler or plastic worm directly into the fish bed. Often the bass will pick it up and carry it a few feet away and drop it outside the nest. Occasionally, a bass can be hooked when it does this, however.

Though the immunity of bass to most fishing techniques during this period can be frustrating, I suspect it serves an important conservation function because it protects the bass and thus contributes to a new crop of bass.

The last period of spring bass activity is the post-spawn. The young have hatched from the eggs and left the nest in a group as a school. The male bass constantly swims with them and guards them from predation by other fish. The school will have hundreds of these little bass less than an inch long that will stay together as a tight cluster perhaps only 2 or 3 feet in diameter. They swim at the surface, and it is easy to recognize them from the cluster of many little surface dimples made by their swimming activity.

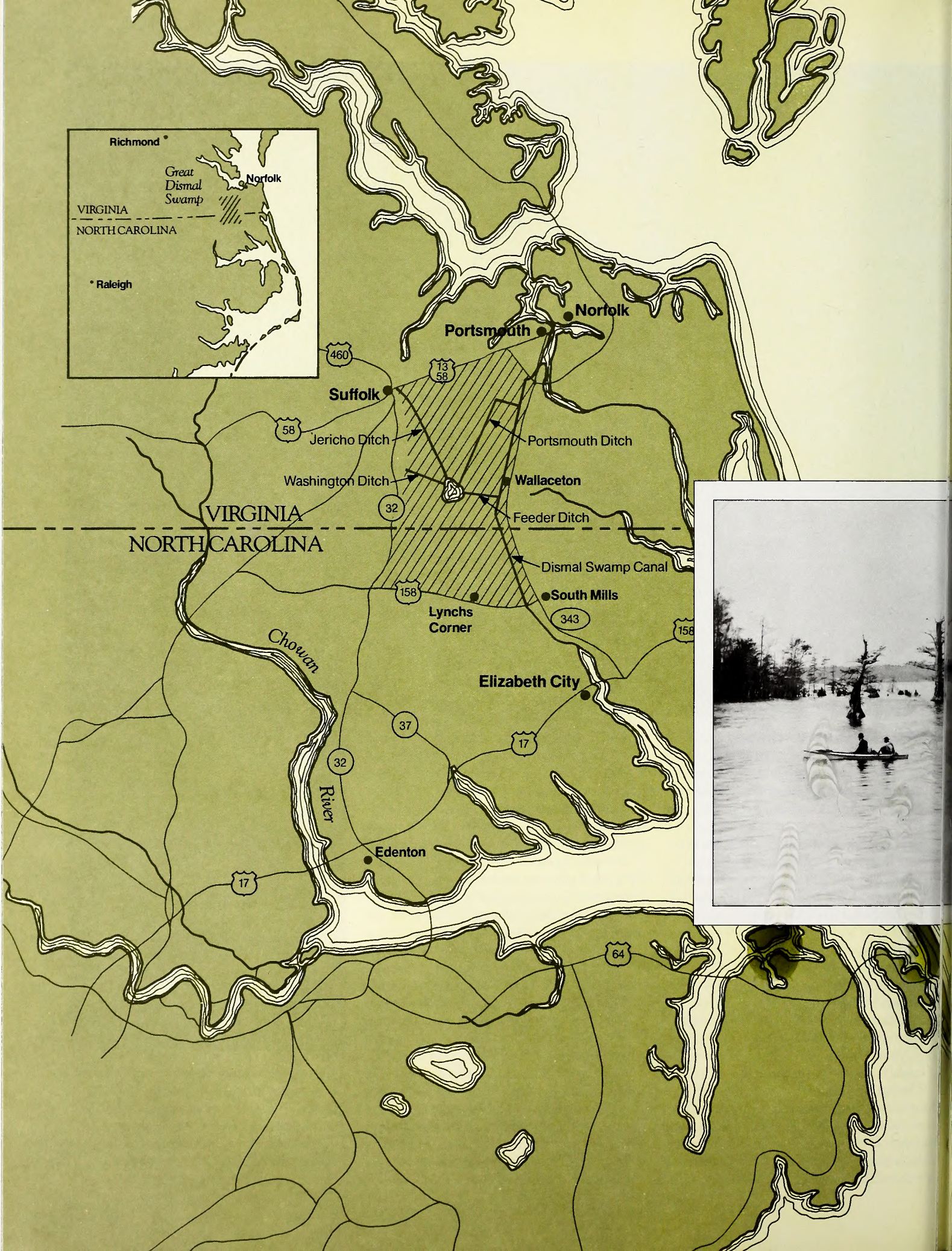
Because the male bass is spending full time guarding these young bass from predators, it is not surprising that he is ready to attack anything approaching the school. A lure moving through this school is perceived as a threat, and the guarding bass will engulf it with a vengeance. Male bass, however, are usually smaller than females, and a protective male often weighs only 1 to 2 pounds. If you catch them, release them so they can continue to protect the young.

After the young bass grow to about an inch long, the predator instinct in them becomes evident, and the larger ones begin feeding on the smaller ones. A 1¼-inch bass can consume a ¾-inch one! Once such predation begins, it is not surprising that the school breaks up in a hurry.

During this period the female bass are not associated with the male or the school and are usually found alone.

These fish they are recovering from their weight loss and the rigors of spawning, and many fishermen who catch these spawned-out females look at their flabby bellies and wonder how much heavier they would have been if caught a month or two earlier.

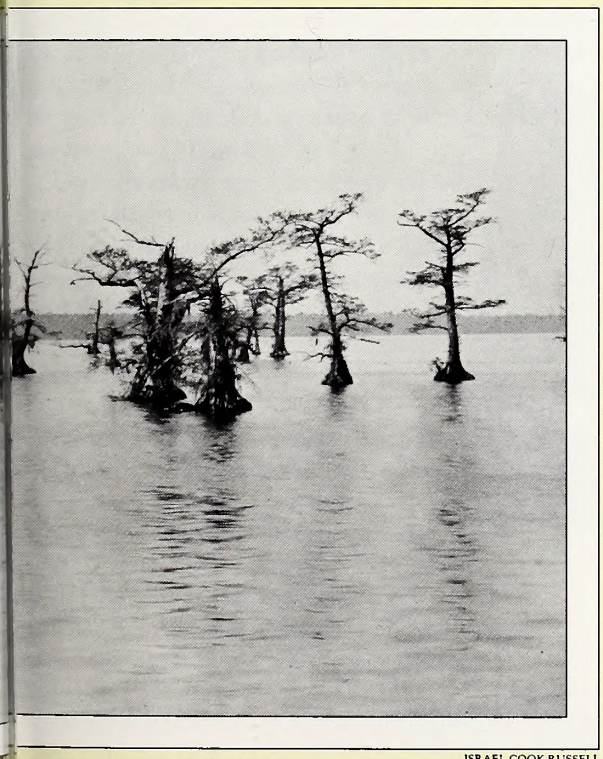
Spring is an important time both for the fisherman and for the fish. For the bass, it is a time of sexual maturity and reproduction, a time to assure that a new crop of bass is produced for future seasons. For the fisherman, it's the best time of the year to catch bass if you know what the bass are doing and adapt fishing techniques to fit the changing situation. ☒


Richmond
Great Dismal Swamp
Norfolk
VIRGINIA
NORTH CAROLINA
Raleigh
Norfolk
Portsmouth
460
13
58
Suffolk
58
Jericho Ditch
Portsmouth Ditch
Washington Ditch
Wallaceton
32
VIRGINIA
NORTH CAROLINA
Feeder Ditch
Dismal Swamp Canal
158
South Mills
Lynchs Corner
343
158
Chowan
Elizabeth City
37
17
32
River
Edenton
17
64

THE GREAT DISMAL
A Carolinian's Swamp Memoir

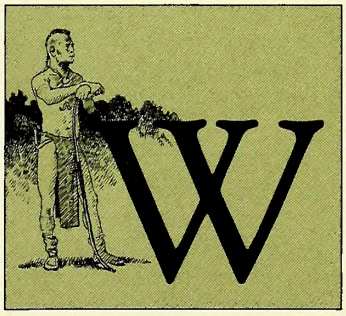
"This vast wild region is a place well fit for a grand gathering of ghosts, a place simultaneously aswarm with the spirits of all ages here, of fin, feather, fur and manflesh; nor am I exempt."

by Bland Simpson



ISRAEL COOK RUSSELL

Eastern Lake Drummond in 1880s.



ILLUSTRATED BY DAVID WILLIAMS

When I was a boy, my father and I used to go out boating on the broad, black Pasquotank River running through Elizabeth City, North Carolina. If we followed it all the way upstream, my father used to tell me, we would disappear with the river into the Great Dismal Swamp.

We would not have been the first.

The Great Dismal has been around for ten thousand years, five hundred generations, and some unknown Indian man, woman or child who sleeps deep beneath the mantle of peat, the floor of this great boggy wood, unremarked and unmourned holds that honor. The Powhatan had hunted the Swamp in that ancient age, when it was a great reach of open marsh. Their bola-weights, spheres and ovoids and dimpled stones, once thonged together and slung at waterfowl, have turned up all over the vast morass, most along the Suffolk Scarp, the ancient Pleistocene seabeach at the Swamp's western edge. So have their projectile points, the tools and weapons

they went to once the broad marsh had grown up in boreal forest, jack pines and spruce.

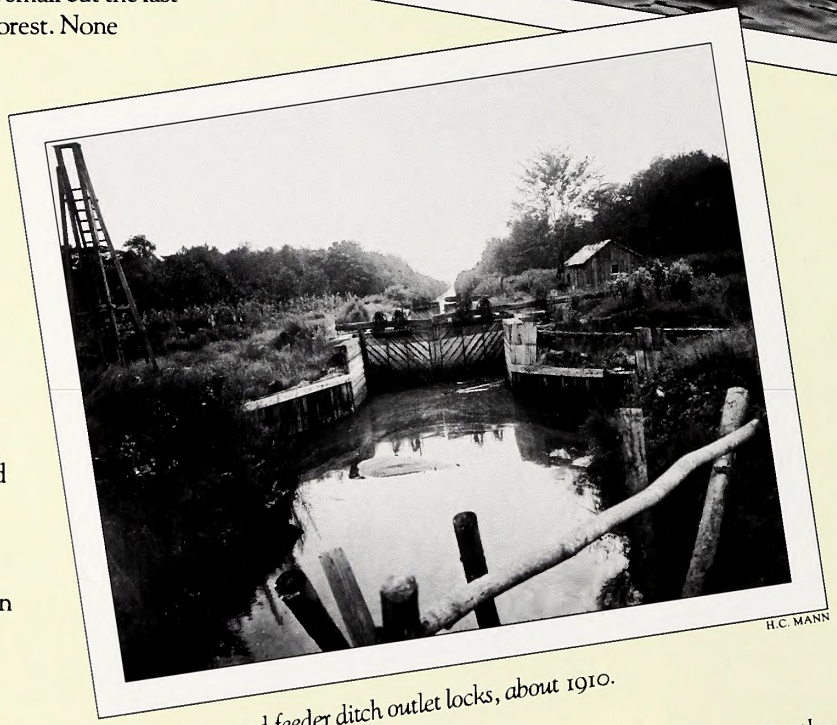
The Ice Age had ended and the climate warmed, and the cold-weather woods fell in succession to new forests, first of beech and birch, then of oak and hickory, and these went down in turn to a wet stretch of cypress and gum and cedar, here called juniper. Still the Powhatan were in the Great Dismal, and not just to hunt. They left behind them potsherds and pollen, the spores of maize, grains too heavy to be wind-borne far from where they grew — the Indians were farming at the very heart of the Swamp.

Nansemond was the name of one of the thirty peoples that Wahunsonacock — Chief Powhatan, father of Pocahontas — counted among his empire in the early 1600s. Their home then was in the Swamp along the Suffolk Scarp, but three centuries after Jamestown a few of them clustered together around the village of Chuckatuck, north of Suffolk, Virginia, in the 1930s, there to die out as timber outfits great and small cut the last of the Swamp's virgin forest. None now speak their tongue, but in my lifetime a Nansemond named Earl Bass hunted the Swamp from the north side.

WIRT A. CHRISTIAN JR.

Sportsman's Lodge on Lake Drummond, 1960.

From car windows as a boy I stared at Earl Bass's Swamp, the corridor of switch cane and big pines between Suffolk and Norfolk that is U.S. 13/58. And I saw the cypress go to gold and rust each autumn in the sloughs along U.S. 158, between Morgans Corner and Sunbury. My Ferebee cousins in Camden carried me into the Swamp's southern edge, for it was their own backyard, and we its diminutive natives. I was no Nansemond, but I knew I was Powhatan aplenty from the moment my great-aunt Jennie told me I was kin to Pocahontas — that through the Virginia Blands a smidgen of her blood ran in my veins.



H.C. MANN

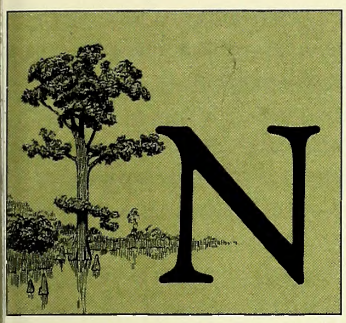
Lake Drummond feeder ditch outlet locks, about 1910.

Mostly I knew the Swamp from countless rides up and down the Canalbank, the twenty-two-mile straightaway of U.S. 17, through pines and reeds and fields from South Mills, North Carolina, to Deep Creek, Virginia. The dark Dismal Swamp Canal this road ran beside was the watercourse that tied the Chesapeake to the Albemarle, and for all my growing up I watched the implacable jungle beyond it and heard its simple standard lore: the Swamp was full of runaway slaves and escaped convicts that the law wouldn't follow in. And I was too young at first to understand or have a sense of time before and beyond my own, believing that these slaves and outlaws were there right then, lurking and staring out at me and my family with bad designs from behind the green curtain, as the Africans on the riverbank had stared at freshwater sailor Charlie Marlow in Joseph Conrad's tale, "Heart of Darkness."

North beyond all this Swamp was Norfolk, the sprawled-out Navytown queen of Tidewater Virginia, provincial capital for northeastern North Carolina as well. So long allied and tied to each other were Norfolk and our northeast that one Hampton Roads editor, frustrated by decades of conflict with Richmond, hoped in the *Herald* in 1852 that his "people release themselves from bondage by annexing the city, come what may, to North Carolina — who would at least treat us with decent and common justice." We small-town Carolinians loved the whole waterfront shebang that the radio called the "world's greatest harbor," and we loved the big wilderness that lay between us and the city.

On many of the days of my youth, going up to Norfolk to see my Lamborn cousins, up to Norfolk to shop for suits and shoes, my mother behind the wheel of our pale blue Plymouth station wagon, up to Norfolk on the school bus on field trips to the zoo, I, like Conrad's Marlow, had gazed back at that bright darkness and thought his same thought:

When I grow up, I will go there.



early twenty years passed before I got the chance. One Indian summer in the early 1970s, New Hampshireman John Foley and I paddled slowly out the Feeder onto Drummond by night and tied up to an old weir stake a couple hundred feet straight out into the lake. The Harvest Moon rolled slowly across the September sky, and the lake was calm under it, with a light breeze and just a hint of a mist. Far away on the north shore was a single light, from the hunters' cabin called "Lady of the Lake." For a good long while we didn't speak, just listened to locusts and crickets and frogs in the dark woods rimmed around us and to the dark water lapping at the little metal boat.

The lake is young as natural lakes go, no more than four thousand years old, and it is simpler to say what did not form it than to say what did. It is not a meteor crater full of water, nor the last bit of an open-water swamp. It is not a Carolina bay, for these elliptical depressions in the Carolina lowlands formed during the Ice Age, not after it, as Drummond did. Perhaps its bottom simply collapsed, as the sinkholes do in Florida, or perhaps a fire deep in the peat left this shallow saucer to fill with juniper water, long remarked and bragged upon.

Drummond's water is famous, for it would stay fresh a year or more, full of tannic acid as it is. Our Navy in the nineteenth century had an iron-hulled tanker built, the *Water Witch*, to run up to Drummond and fill up and bring good fresh Dismal Swamp water back to supply the fleet. But the *Water Witch* was too stout to get through the Deep Creek locks. Even so, they say Admiral Matthew Perry carried casks of this water to Japan on his Pacific Overtures trip in 1853.

It is the color of tea, madeira, port, brandy, bourbon, ruby, chocolate, blood, folks say. My friend Homer Foil told me it looked to him like black-bean soup, another comrade said Killian's Red Ale. John Foley and I drank a lot of it while we were there that week, chased the rye with it as we lolled in the canoe that night under the moon. "Rainwater sweet," Foley said of it.

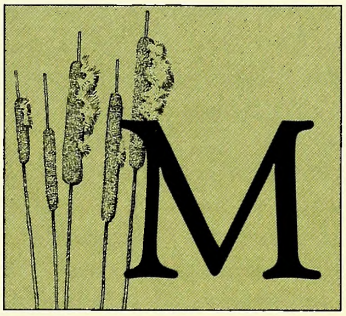
"*Who cooks for you?*"

The first barred owl's cry broke the spell.

"*Who cooks for you-all?*"

At least two of them were calling back and forth, but it was hard to pinpoint where they were, their cries so filled the woods and the empty edge of the lake. I replied, and my own echo came back at us greatly amplified. I gave the gunwale a sharp rap, a flat slap of my hand, and it was a rifle shot on its return.

Bats, which live and breed in the empty cypress stumps in the lake, had been out all evening, but now they began to dart close, cutting across the canoe and around our heads. We called it a night and headed on in to the spillway, all lit up across the top with a string of lights. These glistened in the dark Swamp night, and they reflected glittering off the dark waters. It was like coming upon a riverboat lodged up some bayou, with a Cajun ball just underway.

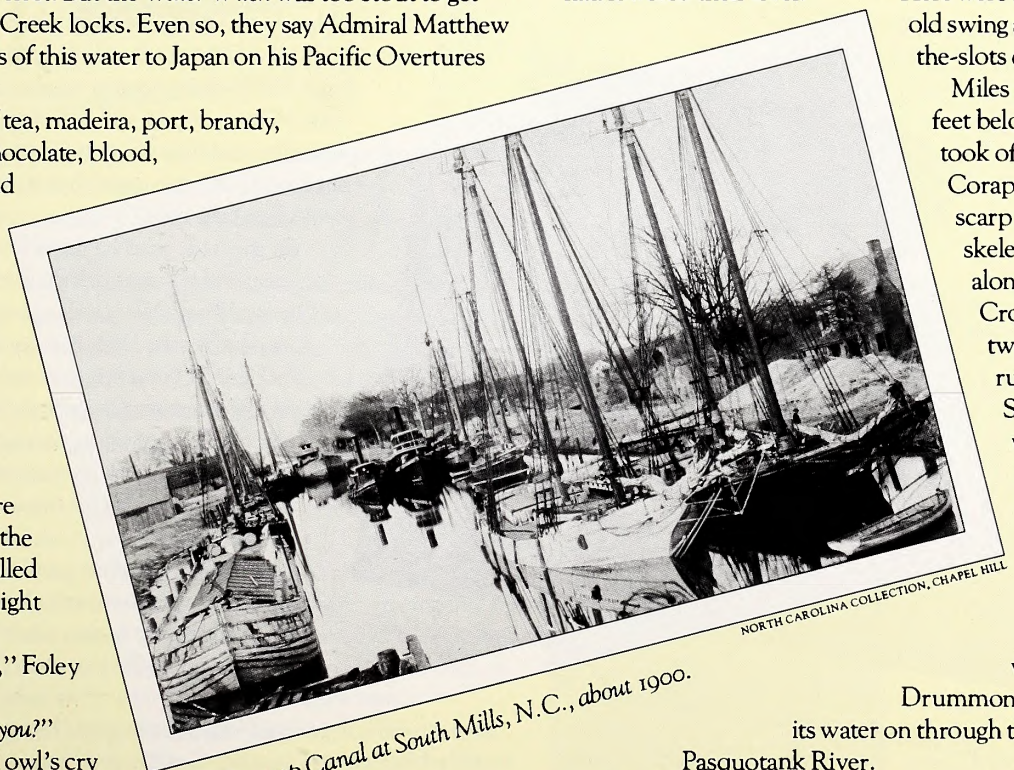


uch of the dark water that flows into the Great Dismal runs in from the west, from Cypress Swamp. There, where the Desert Road bridges it, I have heard the call of a hairy woodpecker in early February and seen the work of a pileated woodpecker on a tupelo gum stump in the water: gum chips like half-dollars, all dug and pocked out by the pileated, lay about the base of the stump, and on a bright ice collar around it just above the water.

Stopping there again on a balmy late-April day, I saw poison ivy on the gum stump where resurrection fern had been growing before. A great blue heron flew through the tupelos, over and above the trash that protruded from the swampwaters now that spring had lowered their level. Here were a brown space heater, an old swing set, a faded red slide-up-the-slots drink box.

Miles to the south, not ten feet below the Virginia line, I took off into the Swamp on the Corapeake Ditch, down the scarp and past another skeletal mill ruin, then south along Sherrill Ditch to Cross Canal, the ancient twelve-mile ditch that runs the width of the Swamp from east to west. Cross Canal, also known as Hamburg Ditch, is the other great bringer of surface water into the Swamp. But unlike Cypress Swamp, which replenishes Lake Drummond, Cross Canal drains its water on through the Swamp and into Pasquotank River.

This April day, the Cross Canal was flowing right well to the east, towards the Pasquotank and the Dismal Swamp Canal, and, as I backtracked towards the western edge of the Great Dismal and



NORTH CAROLINA COLLECTION, CHAPEL HILL

Dismal Swamp Canal at South Mills, N.C., about 1900.

walked over Cross Canal on a wooden footbridge, I watched the waters just pouring into it through rafts of lily pads. A pair of wood ducks jumped up, winged their way back and forth along Cross Canal and the heavy-grassed road beside it, and a yellow-bottomed, brown-winged singer, a prothonotary warbler, flitted quickly in and out of the woods wall. Anxious and at a half trot, for the days fade early in the darkness of tall timber, I stalked rapidly right out of the Swamp and into a plowed field and way overshot my mark:

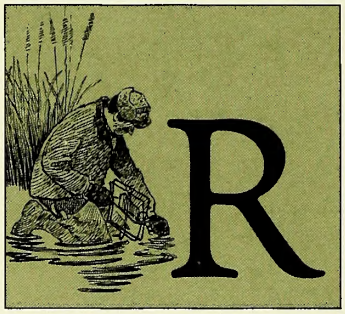
Remnant Marsh.

These sixty acres of grasses and sedges, of cattails and golden club, were all that remained of Washington's Rice Farm. George Washington had seen Norfleet's mill and meadows here at this mouth of the Swamp during his first horseback circumnavigation of the Great Dismal, in May of 1763, and had bought into eleven hundred acres of it three years later. Already men were laboring for his "Adventures for Draining the Dismal Swamp," living at Dismal Town near what is now the western end of Washington Ditch and cutting that ditch itself along a causeway into Lake Drummond. Three hundred acres of ditched and diked marsh at Norfleet's, down in Carolina, would help feed them.

I turned around at the Holly Grove field and retraced my steps. Blackberry blossoms were coming on in roadside brambles, and there were stalky lavender flowers and violets growing low. Now the sun had sunk down enough that its last light was coming at a long low slant into the marsh clearing — some seventy-five yards north of Cross Canal through a thick, mature stand of gum and cypress — and making the little green marsh glow like gold.

Into the damp cypress bog I threw myself, for I was determined to walk about the marsh. My two companions stayed behind at Cross Canal and made me owl-hoot back to them constantly so I wouldn't get lost. No water stood in the marsh, and there were winding through the thick grass the trails of deer and smaller animals. Young maples and gums had taken hold, and it was clear the whole of the marsh could soon disappear.

What I saw was not what Washington had in mind when he established the Rice Farm here, but there was nothing else like it in the Swamp today, and I thought it one of the loveliest spots in all of the Great Dismal.



Reggie Gregory was out in his barn working on a broken-down tractor. He had promised a man he'd saw some timber for him on the little sawmill in his backyard, but the tractor powered the mill and it had had them foxed all day.

"Thought it was the water pump," he said to me, after I had walked up and stood outside the work circle he and several other men formed. "Pulled it, put it back, tractor's still losing water — turned out to be the freeze plugs in the damn thing."

Beyond the big oaks and the barn and the broad lawn, not a hundred feet past his two-story frame farmhouse and his sawmill, the Swamp began. Reggie scrubbed the grease off his arms out in the yard and waved that way, inviting the disappointed man whose timber had gone unsawn to come along with us.

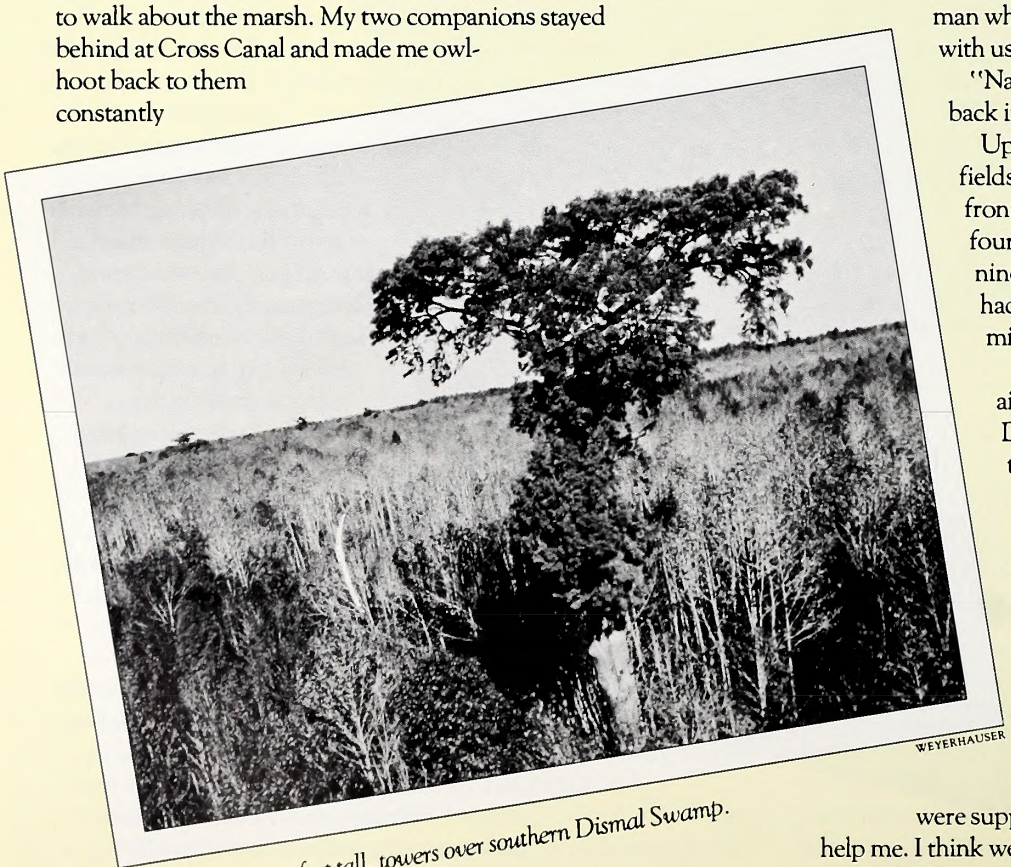
"Naw, Reggie," he said, "I ain't interested in going back in that Swamp. You go on without me."

Up a broad grass roadway between ditches and fields we drove into the Swamp, the two of us in my front-wheel-drive station wagon. Now it was past four o'clock, the air still and close in the middle nineties, and we were going now because Reggie had said, "It's too damn hot in the Swamp in the middle of the day."

Of the wide road he remarked, "We built this airstrip when I was with the Forest Service. During World War II, the government hired me to look after the Dismal Swamp, keep the fire out of there on account of the smoke — they wasn't interested in saving the timber. It was just on account of the smoke, it was bothering the boys flying the planes on the coast down here. And they hired me: I was the Dismal Swamp Ranger.

"And I hired about forty men, I reckon, to work just temporarily with me. They lived right at home, wasn't supposed to do anything till I called 'em to a fire. Then they were supposed to drop what they were doing and come help me. I think we paid 'em about eighty, hundred dollars a month. Had 'em in Camden, Currituck, down in Dare, all around.

"The state bought some warplanes, converted them into tankers — they'd hold three hundred gallons of water and chemicals. We had three, four of 'em down here. And we had



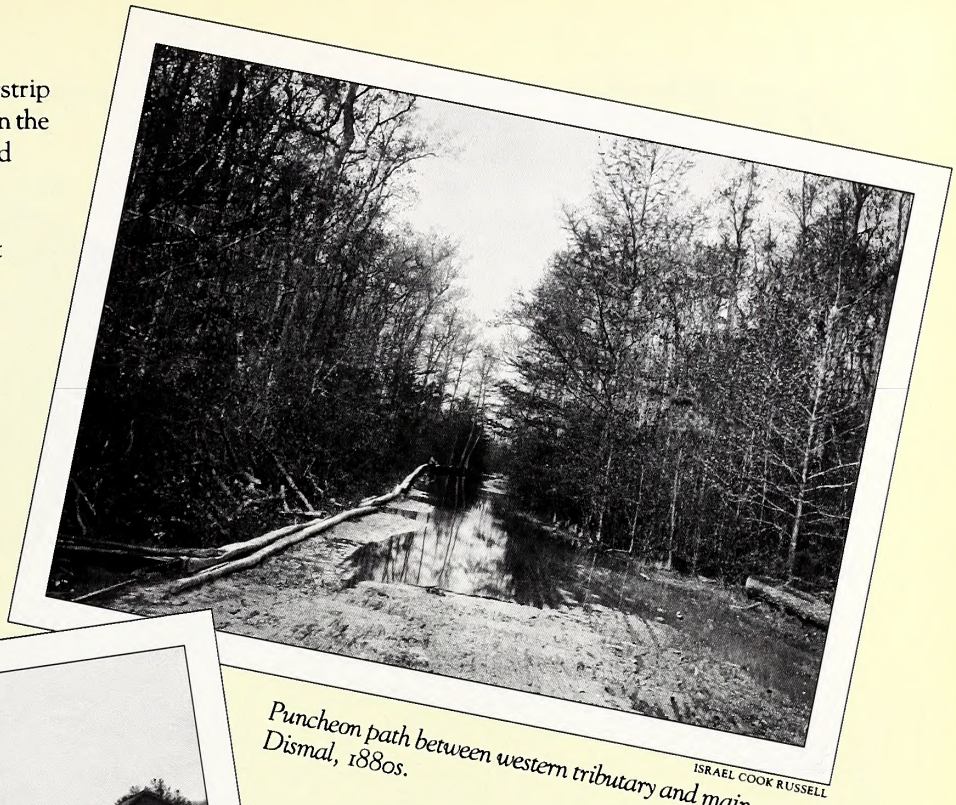
WEYERHAUSER

Bald cypress, 125-feet tall, towers over southern Dismal Swamp.

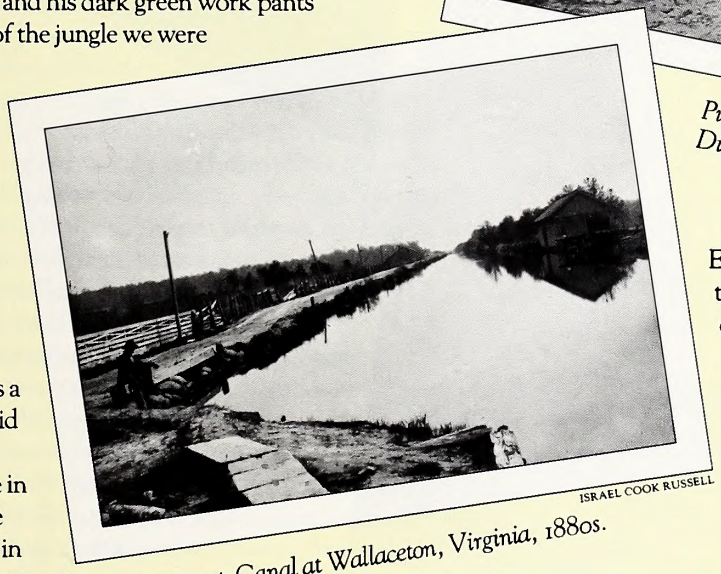
portable mixing tanks that we'd bring over here to this airstrip and set 'em up. I know one time we had a fire back there in the Swamp on the Corapeake Road, and we mixed and loaded here on this airstrip. They were dumping a load of water every three minutes on that fire.

"And then after the war was over, the government quit that. I went to come back on the farm, and then later on I got a job at the Forest Service, as a district forest ranger, and I stayed there till I was sixty-five and a half, and retired. Still lived here at the farm."

The airstrip ended and the road narrowed, and the Swamp woods yanked right up next to us. At a massive iron gate we stopped, and Reggie got out and went and unlocked the Great Dismal. He gave the gate a good strong shove and waved me through as it swung open. Beneath his feedstore cap his long face was all a-sweat, and his dark green work pants were the color of the jungle we were entering. He was pushing eighty, but Reggie was so sturdy and resolute and at home that he didn't look much more than sixty.



Puncheon path between western tributary and main Dismal, 1880s. ISRAEL COOK RUSSELL



Dismal Swamp Canal at Wallaceton, Virginia, 1880s. ISRAEL COOK RUSSELL

"When I was a boy," Reggie said as we rode on, "I'd leave home in the dark, before day, come back in here and work my trap lines, wearing hip boots, walking in water up to my knees all day, get back home about dark. In here alone all day, nobody knowing where I was. What if I'd sprained a ankle? Could of been it. You know, that was stupid!"

So he said now. But fifty years ago, by the time he was in his mid-twenties, Reggie Gregory was running a line of three hundred end-spring Victor traps spread out over a fifteen-mile round trip through the southern Great Dismal. "And I'd make that trip about three times a week. I did that for about eight years, that's where I made the biggest part of my living.

"But I wasn't the only one. A lot of the other fellows up here that was farming did the same thing. A whole lot of 'em would of lost their little farms if it hadn't been for this Swamp. There was twenty, twenty-five people doing the same thing, right in this section. On the Gates County side, I don't know how many was trapping in there 'cause back in those days we didn't go on the other side of the Swamp much. That was way way from home when you got over on that side of the Swamp."

Reggie remembered Depression soybeans going for fifty cents a bushel, corn for a quarter. Farm labor paid a dollar a day. "And I could go back in that Swamp and catch a mink, and get seven dollars for him. I would catch seven, eight, sometimes ten minks a week. Coonskins was from three to five dollars.

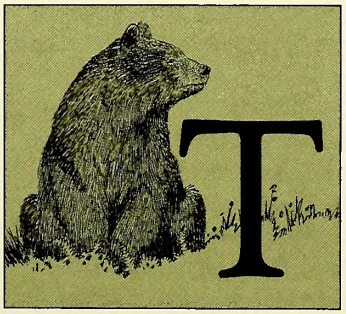
"Duck Glover in Elizabeth City was the main man, the main buyer. He would skin 'em, scrape 'em, clean 'em up, and he carried em to New York and sold 'em up there."

When minks went high, sometimes up to ten and fifteen dollars apiece, the local buyers didn't wait in country stores or remote outposts for the trappers to bring the fur to them. "There was another fellow, I can't remember his name, but he was a Jew out of Virginia. He'd find your car where you'd parked, or mule and cart, whatever you drove up to the Swamp, and he'd sit *there* and wait for you to come back. I've come out there lots of times and he paid me a hundred dollars for that day's work, and that's more money than I got off the farm the whole year. So if it hadn't been for that old Swamp, you see what kind of shape I'd of been in, and a lot of my friends would of been in. That's why I hate to see it closed down, where we can't use it."

Some of Reggie's steel traps are in the Swamp yet. Every year when trapping ended he gathered them all up and hid them in a hollow log until the next season. He thought about that a minute and said, "As far as I know they're still there."

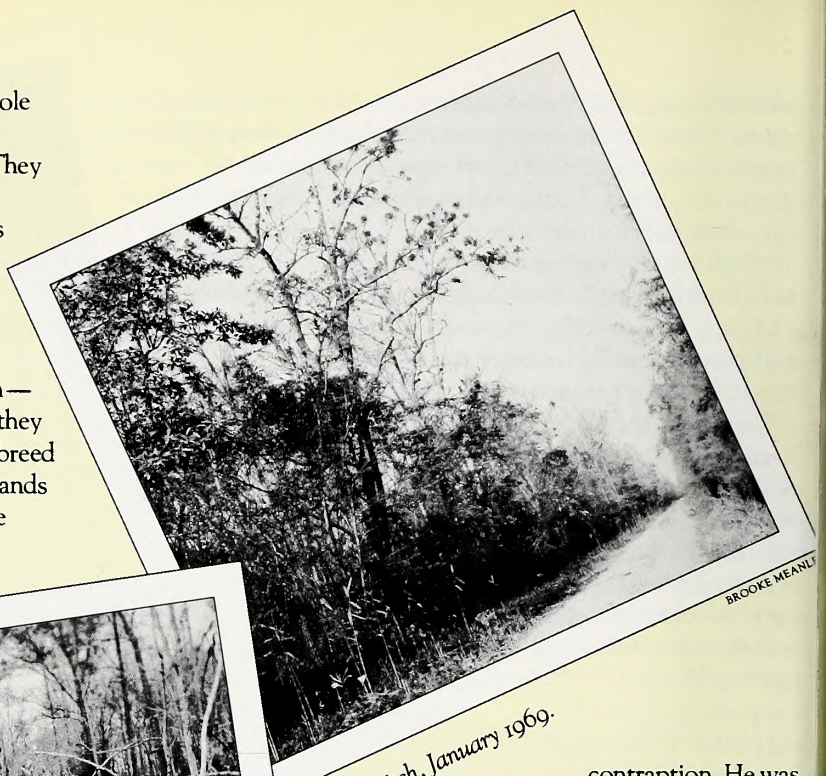
"Could you go to that log?" I asked him.

"No," he said, admitting the changes in the landscape and in himself, "I couldn't find that log today."



The Cedar Works railroad hits the Forest Line Road about a mile below the Carolina and Virginia border, and there in the cedar thicket on both sides of the sandy lane we stopped again.

In close ranks the cedar spires stand, each tree a tall tawny pole with bark in thin vertical strips marking a slow swirling whorl around and about the tree up to its dark green arrow-crown. They grow in a thick, high-acid peat of their own making and reach heights of sixty and seventy feet, diameters of a foot. Deadfalls and windfalls cross and lap each other on the forest floor, and walking in the cedars is slow going, or no going at all. A watercolorist touring the cedar thicket on Camp Ditch, two or three miles north of Lake Drummond, called the color of the cedars' high crowns thalo-cyanine green — the coldest, darkest green on the palette — and said the shade they cast was a dark shade. Only wood thrush and blue jay usually breed in the cedar woods, though in winter pine siskins by the thousands will feed on the little juniper cones. On aerial photographs, the Swamp's few remaining patches of cedar show up stark and dramatic, like shadows on the moon.



BROOKE MEANLY

Jericho Ditch, January 1969.

COURTESY ELISABETH PARKER ROBERTS

Surry Parker and family touring eastern Dismal, about 1920.

"Well," Reggie said, "there's your juniper."

We left the car and stumbled into the woods, and here the railroad grade was just an elongated mound a foot or two above the forest floor and all grown up in cedars. Only an old swamper could have gone right to it, for from the Forest Line Road it was indistinguishable from the rest of the juniper thicket.

"Looka here," he said, and called me over to a cedar he was studying. "They caught 'em a bear here. See, they had their trap chained onto this tree right here, and you can see how the bear worked at it, yanked on it, dug the chain in, made them marks there. Old bear didn't like it one bit."

Just beyond the tree we'd been studying was a four-inch juniper sapling that the angry, fettered bear had broken off and splintered at about chest height. "No," Reggie said again, "bear don't like to be held up. Well, that's some more of the old railroad, all's left of it."

Up the road apiece we ran across the bear man, Eric Hellgren, an ingenuous curly-haired and freckle-faced fellow in his twenties roaring about the Swamp roads on a red four-wheeler all-terrain contraption. He was busy catching black bears for a study run by Virginia Polytechnical Institute, then setting them loose with radio collars and tracking their Great Dismal peregrinations, picking up their bruin broadcasts with a portable radio and a directional H antenna that looked like a toaster-oven element on a handle and that he held aloft and waved all around as he made his own daily pilgrimages through the Swamp.

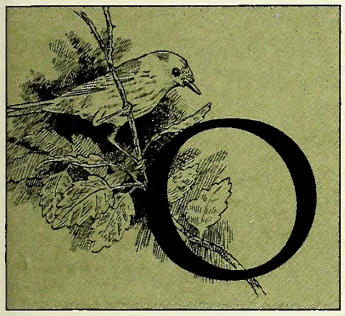
"Just caught our sixty-fifth bear this afternoon, a little fifty-five-pound girl," Eric told us excitedly. Eventually they would catch and tag a hundred and one, reckoning the Swamp as home to two hundred and sixty. In his recent survey *The Great Cypress Swamps*, John Dennis ranked the Dismal's bear population as one of the primary three on the East Coast, along with those in North Carolina's Alligator River swamps and in Georgia's Okefenokee.

Eric said that the bears had been feeding on black cherry but now were hitting the pokeweed that grew along the ditchbanks and roadsides. As we drove on, east along Corapeake Ditch, we saw many places where the lanky, ink-berried pokeweed was knocked over onto the road, and then, about forty yards up the lane from us we saw a small bear. I stopped, and the bear stuck its nose high into the air, worked it about, looked at us, then bolted about ten or fifteen yards farther down the road. It looked back at us while I grabbed a camera, and right when I was ready, it dove south into the Swamp and disappeared.

"You won't see him no more — he's gone," said Reggie.

The Gregory family, like many families farming the margins of the Great Dismal, once had big trouble with bears tearing up their crops. One year the bears were so thick he said it always looked like cattle had been in their corn. They killed twenty-seven bears, right there in the field, some of them as heavy as four hundred pounds. Sometimes men sat up on stands waiting for the bears to leave the

Swamp and enter the fields. Sometimes they set trip-wire shotguns, loaded with double-ought buckshot, slugs, or, as Reggie said, "anything we could get." One farmer he knew stoked up a muzzleloader with a leg broken off of a cast-iron pot. "He'd kill a bear and take it out, load it in his gun again, set it again — fellow killed four bears with the same potleg."



One day, at the heavy, iron-pipe National Wildlife Refuge gate, I met an old-time birdman, ornithologist Brooke Meanley, who has studied wildlife and Southern swamps all his life and who with his wife, Anna, comes down from the Shenandoah Valley several times a year and wanders his favorite of them all, the Great Dismal.

Brooke Meanley was a slightly stocky man in his sixties, thoughtful, good-humored, and unhurried. Anna Meanley was small and bright-eyed and, though quiet, seemed as well-versed in the ways of the woods as her husband. They had been good partners for each other, traipsing together about all the Southern bogs and bayous and riverbottoms to which Brooke's work with the Fish and Wildlife Service had sent him.

How had they met? I asked her.

"On a birdwatching trip," she smiled and said.

The day was crisp, not yet fifty degrees, and patches of snow that had fallen across Virginia earlier in the week lay along the road beside Jericho Ditch. As we walked north up Jericho towards the Williamson Ditch, our footfalls noisy on the wet sand road, Brooke spoke easily and steadily about the Swamp world we were moving through.

"There's a pileated woodpecker," he said, when we heard the big bird's cuk-cuk cry. I thought of all the hopeful people who have mistaken pileateds for ivory-bills, and of Audubon's T. Gilbert Pearson, who unsuccessfully sought the ivory-billed woodpecker here in the Dismal nearly a century ago.

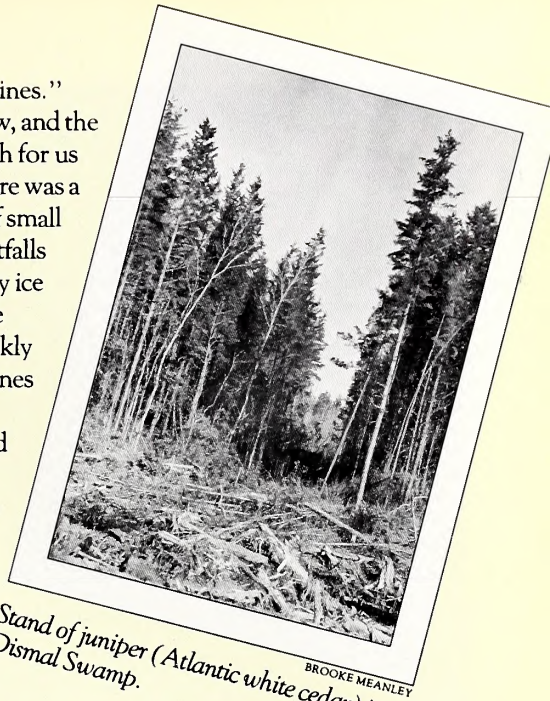
"Mistletoe," Brooke pointed up, "a lot of the birds eat that — bluebirds, mockingbirds, cedar waxwings. Red bay, swamp magnolia in here too. This little green vine, that's one of the smilaxes, greenbrier. We've got a lot of the prothonotary warblers, they like the ditches — the number one breeding bird, or nesting bird, in the Swamp. Lot of the birds feed on poison ivy berries. Almost any bird in here that feeds on smilax likes poison ivy berries much better. And the holly berries are a great food, robins love those. That's a red-bellied woodpecker, very common, hear that?

"I think that's a horse-sugar, or sweet pea — good deer foraging plant. Now we're getting into a mesic forest, sort of between swamp and upland forest, lot of white oak in here, and beech. This is a red oak. Swamp chestnut oak, water oak, sweet gum. This north end of the Swamp is drier than the rest of it, an exceptionally dry area compared to the rest of the Swamp. And you get a change. See those pines? These hardwoods, and the loblolly, that means you've got a drier area. Not too dry, 'cause there's quite a bit of beech right in here, and beech grows where there's a little moisture.

"The pine warblers hang around here. The yellow-throated warbler, which is the earliest warbler to come in from the tropics, comes in here in the middle of March. You usually find them singing in the loblolly pines."

It was after noon now, and the day had warmed enough for us to unzip our coats. There was a frequent thrumming of small aircraft, our steady footfalls in the wet sand, and tiny ice raining down out of the trees and sounding briskly upon the bushes and vines below like shot.

"The Great Songbird Swamp, I call it," Brooke said. "There're about eighty-five species of breeding birds in here, and it's more of a songbird refuge than anything else. Most of our refuges, or certainly a lot of them, were originally set up as waterfowl sanctuaries. Oh, you get some large waders, like herons, egrets, occasionally along a ditch, a few down at the lake. Course you get some waterbirds on the lake, ducks, loons, gulls, not too many. You know, the lake's pretty sterile. Doesn't have any submerged aquatic vegetation, which is duck food. No emergent vegetation. Just water surrounded by the forest, so it's just more of a resting place for waterbirds."



Stand of juniper (Atlantic white cedar) in Dismal Swamp.

"What about raptors?" I said.

"Well, you have two basic raptors: the barred owl and red-shouldered hawk, they're Swamp birds. You get others coming through in migration, few others nest in here sometimes. I've seen a great horned owl in here during nesting season. You get a good migration of hawks across this lake later on in October: sharp-shinned hawk, Cooper's hawk, broad-winged hawk, and some others. But this is mainly a songbird swamp."

"Why," I finally asked, "is the Dismal your favorite of all the swamps and bottomlands?"

"I don't know. It's an emotional thing, I guess, partly. The fact that it's the northernmost of the great Southern swamps, and all this Southern stuff kind of comes all the way up, is dumped in here. See, these plants are up in here because of the moderating influence of the Gulf Stream offshore. Comes up almost to the Carolina-Virginia line, then it swings over out in the ocean towards England. But I think it's the history of it, the mystery of it, fact that it's the northern limit of so many Southern plants and animals. And it's right next to this huge metropolitan area, a million, maybe several million people. Sort of a special thing, don't you think? To have this area so close to civilization, this great wilderness." ⊠

This article consists of excerpts from The Great Dismal: A Carolinian's Swamp Memoir, *by Bland Simpson, reprinted courtesy of the author and The University of North Carolina Press. Publication is March 16, 1990. Copies may be ordered from the Press for $16.95 plus $1.50 for postage and handling (P.O. Box 2288, Chapel Hill, N.C. 27515-2288) or may be purchased in bookstores.*

Everyone Loves This Grass

Does it matter to quail and rabbits what a cow eats? As a matter of fact, it does.

by Vic Venters

There appear to be some significant changes in store for small-game habitat on many farms and, for once, it's not a tale of woe. Here's what some experts are predicting — and hoping — will take place on the farms that raise livestock, especially cattle.

It is no secret that things have been going badly for quail and other small game in recent decades, and part of the problem is pastureland. Hedges, thickets and bottomland coveys used for cover have been cleared, along with the lespedeza, soybeans and other plants the quail depended on for food. Although less obvious, the widespread introduction of fescue, a grass used for livestock forage, has also been increasingly credited with contributing to the decline of small-game habitat. This European grass provides almost no food and cover for small game.

Against this sad scenario a subtle and important change has begun to take place. More and more farmers are discovering grasses that provide better forage for cattle than fescue. These native grasses — called warm-season grasses — also just happen to provide overhead cover that protects quail and other small game from aerial predators such as hawks and owls. The interspersed clumps of grass also create hiding places and escape routes from ground predators. Furthermore, they furnish excellent nesting cover and attract many insects, thus providing protein for small game.

Switchgrass, one of the native varieties, grows well in the summer months when fescue — a cool-season grass — lies dormant. Cattle grow fat feeding year-round on a combination of new native grasses and fescue. The result is a quiet revolution that seems promising on every front.

Is it really possible that such a miracle could take place? Are there really grasses that are better for both wildlife and livestock? It appears so, and the result could create rare harmony between wildlife and agriculture.

Wildlife losses have been especially noticeable in areas of the Piedmont and foothills where fescue and other cool-season grasses now dominate as pasture grasses. Fescue wasn't always so abundant. In the 1940s, most Piedmont counties had an average of 10,000 to 20,000 acres of land planted in lespedeza, an excellent food and cover crop for small game. Probably not coincidentally, quail and rabbit populations were high at that time. However, during the 1960s, the use of fescue for forage and erosion-control became prevalent. Farmers and erosion-control specialists like fescue because it is easy to plant, is inexpensive, takes little maintenance and can withstand mismanagement. Being a cool-season grass, it does most of its growing in the moderate temperatures in spring and fall. During those months, it is fairly nutritious for cattle, and it also provides excellent erosion control.

Unfortunately, fescue and most other cool-season grasses are virtually worthless to wildlife. Fescue forms a thick sod and a continuous, non-broken mat of vegetation, providing little overhead cover and leaving few escape routes from predators at ground level. Insects don't find it particularly hospitable and, worse, biologists believe that a fungus found in some fescue stands may be toxic to rabbits.

The warm-season grasses, which do most of their growing in the hot summer months, offer the possibility of supplementing cool-season grasses as cattle forage in the summer. Consequently, if enough acreage is planted, the state's small game should benefit as a result of the excellent habitat the warm-season grasses provide.

Actually, warm-season grasses are nothing new to North Carolina. Before European settlement of the state, a wide variety of these native grasses — switchgrass, Indian grass, big bluestem and little bluestem — flourished in vast pine savannahs. Longleaf pine provided much of the overstory, while yearly fires caused by lightning kept competing hardwoods and brush under control. However, as man has restricted the use of fire, the range and abundance of the grasses have greatly decreased. Today native warm-season grasses are usually found growing along roadways and ditchbanks where annual mowing keeps competing vegetative succession down.

***Bobwhite quail** and other small game will benefit if the use of warm-season grasses becomes prevalent in North Carolina. In addition to providing overhead cover for quail, these grasses also attract many insects, thus providing needed protein for quail hatchlings.*

KEN TAYLOR

***Wildlife Commission** biologists examine a stand of warm-season grass in an experimental plot at North Carolina State University. Because the grasses can provide excellent forage for cattle during the summer months, wildlife biologists hope they will become more widespread across the state as cattle growers discover their usefulness.*

In the prairie states, however, there has been a resurgent use of native warm-season grasses that are actively managed to provide excellent forage for cattle in the summer months. Missouri began experimenting with restoring native warm-season grasses — which once formed the state's vast prairies — in the late 1960s. Today, Missouri has planted between 55,000 and 70,000 acres and not only have cattle benefitted, wildlife biologists in the Midwest are also pleased.

"We are undoubtedly seeing an increase in small game where these native warm-season grasses are well-managed," said Steve Clubine, a biologist with the Missouri Department of Conservation. "There's about one quail for every 10 acres of warm-season grass, whereas you might find one bird in 100 acres of fescue."

Terry Sharpe, the small-game biologist for the Wildlife Resources Commission, is excited about the prospects of increased native warm-season grass use here in North Carolina. "These grasses do provide some food value — rabbits will eat it and it's full of insects," Sharpe explained. "But most of the benefits come because these grasses are bunch-forming, clump grasses that provide excellent cover and nesting habitat. In areas where pastureland is a dominant land use, the grasses offer excellent potential for helping small game. These grasses also respond well to periodic burning and that's got some spin-off benefits that also help wildlife."

If the use of warm-season grasses becomes prevalent in the state, it will probably not be because of its benefit to small game. While there are farmers and landowners who will plant food and cover plots for small game and other wildlife, experience has shown that it's simply economically unrealistic to expect farmers to sacrifice potential profits to help wildlife on a large scale. Instead, wildlife biologists hope to promote the grass as excellent cattle forage. Missouri has had great success by following this strategy. "From the very beginning, we've emphasized the value of native grasses as forage," Clubine said.

Of the native warm-season grasses available, switchgrass seems to hold the most promise for North Carolina, at least for the near future. During the past 15 years, researchers at the Agricultural Extension Service at N.C. State University have been perfecting switchgrass as a viable, economical warm-season forage suitable for North Carolina.

Switchgrass is a tall-growing perennial grass adaptable to a wide variety of soil conditions. It grows in clumps, thus providing ground-level shelter for wildlife and insects and is highly nutritious to cattle

when grazed or cut for hay in the summer. It also has a high yield per acre and is drought resistant.

While fescue is adequate for cattle during its cool growing season, it is poor forage in the summer. That's when switchgrass and other warm-season grasses become attractive. Studies in the Midwest show that cattle raised on a rotating crop of switchgrass and cool-season grasses gain an additional 70 pounds per head over livestock fed only on cool-season grasses.

"The base grass will still be fescue or a similar cool-season grass," said Paul Mueller, a researcher with the Agricultural Extension Service at N.C. State University. "But a mixture of warm-season grasses with a cool-season grass can play a very important role in providing some good quality summer forage."

All that's needed to make it popular in the state, researchers say, is to educate farmers and cattlemen about the benefits of switchgrass. "As I see it, planting switchgrass in North Carolina is already a practical option," said Roger Hansard, an erosion-control specialist for the Soil Conservation Service in Raleigh. "The seed source is well-established and most of our extension agents have been exposed to it, a management plan has been formulated and it's essentially ready to go."

Moreover, switchgrass may be best suited to this area initially because of its slick seed, which is capable of being planted by conventional seed drills. While other native warm-season grasses like Indian grass also provide excellent forage, their seeds are chaffy and brushy, requiring specialized equipment to plant. Debearded seed is available but is currently rather expensive.

Switchgrass is more nutritious than Bermuda grass, a non-native warm-season grass now used in the state that has minimal wildlife benefits. "Switchgrass has good qualities if managed correctly," Mueller explained. "The leaves have good digestibility, and that's a weak point with Bermuda grass which is of moderate to low forage quality at best." Another drawback is that Bermuda grass must also be sprig planted. "It's a heck of a lot easier to plant a seed than it is to sprig, especially in the heavy soils in the Piedmont," Hansard added.

While the benefits to cattle and wildlife from warm-season grasses are numerous, switchgrass does require some specialized management. "Most native warm-season grasses are slow in getting started and they will not take a lot of competition from other vigorous plants," Mueller said. This is because during the first season these grasses put most of their growth into establishing an extensive root system. Unless managed, weeds and brush can shade out grass seedlings. "By following a management prescription with switchgrass, you can have a good working stand in one year that will pay off," Hansard said.

STEVE CLUBINE

Unlike fescue, *warm-season grasses offer excellent small-game nesting cover as this quail nest typifies. However, haying and mowing schedules for warm-season grasses will need to be timed so that wildlife nests are not destroyed.*

Once a stand is established, maintenance is low and the stand should be long-lived. "There is no reason why you shouldn't be able to have stands last for 10 years. But you need to suspend succession — by mowing it, grazing or burning it," Mueller said.

While the wider use of switchgrass is only a few years away, other warm-season grasses also hold long-term promise for success. "Here in North Carolina, we need to be looking at Indian grass," Mueller said. "It seems to find niches and regenerate itself."

"Indian grass seems to be all over the state," Hansard agreed. "And from what we've heard from farmers in the prairie states, they have nothing but glowing statements about its palatability to cattle and their weight gain from it."

Before Indian grass and other warm-season grasses become more prevalent in the state, problems with seed dormancy and chaffiness will have to be worked out, plant specialists say. And to maximize the benefits to wildlife, research will also have to be performed to determine grazing and mowing schedules so that those activities will have minimum impact on small game during breeding season. "We need to do more work to evaluate which of these grasses fits in best with our nesting season," Sharpe explained. "We would like to be able to recommend species and varieties that are hayed after the peak of quail-nesting season."

As the 1990s begin, the wider use of warm-season grasses holds promise to help reverse a long-term trend toward small-game habitat degradation. In place of the virtual wildlife deserts of monoculture fescue pastures, there may be diverse stands of both cool-season and warm-season grasses, crops that will benefit both farmers and sportsmen.

However, switchgrass and other native grasses will not overcome decades of habitat loss. The grasses are not miracle crops from which rabbit and quail will magically appear. They will not single-handedly be the salvation of the state's small-game populations. But they could prove that modern farming techniques and our age-old hunting traditions can coexist, and that would be a big step in the right direction.

"Native grasses should not be viewed as a panacea," cautioned Clubine. "They are just a component of a balanced habitat. But they can provide a lot of what wildlife needs." ⊠

The Wild Bunch

HARRY ELLIS

Here's one advisory board whose work isn't dull or predictable. Indeed, the very survival of some wildlife species may depend on this diverse and distinguished group.

by Lawrence S. Earley and John Alderman

In May 1988, two Wildlife Commission biologists, Alan Boynton and Jack Donnelly, had a serious problem on their hands. In several southeastern states including North Carolina, collectors were decimating the populations of two rare mountain species, the bog turtle and the green salamander. The crafty collectors were illegally taking these species in states where the practice was prohibited but then claiming that they were from North Carolina, one of the last states where the species were unprotected. In effect they were "laundering" the illicit trade through North Carolina.

In 1988, North Carolina's own official list of endangered species was in preparation, but Boynton and Donnelly believed that the turtle

Threatened by *collectors, the rare green salamander (below) was granted emergency protection by the Nongame Wildlife Advisory Committee.*

and salamander needed immediate protection. The biologists' concern set in motion a series of events, capped, on August 29 of the same year, by the Wildlife Commission's emergency declaration that the two species were to be considered of "special concern" under the provisions of the state's Endangered Species Act of 1987. Although formal protection wasn't completed until a year later, the Commission's ruling effectively cast the arm of the law around the vulnerable species.

The incident demonstrates well the new-found legal clout of one of the Commission's least-known bodies, the Nongame Wildlife Advisory Committee. It was this committee that put in motion the events that resulted in the protection of the salamander and turtle. Indeed, by law the committee is the only body that can do so.

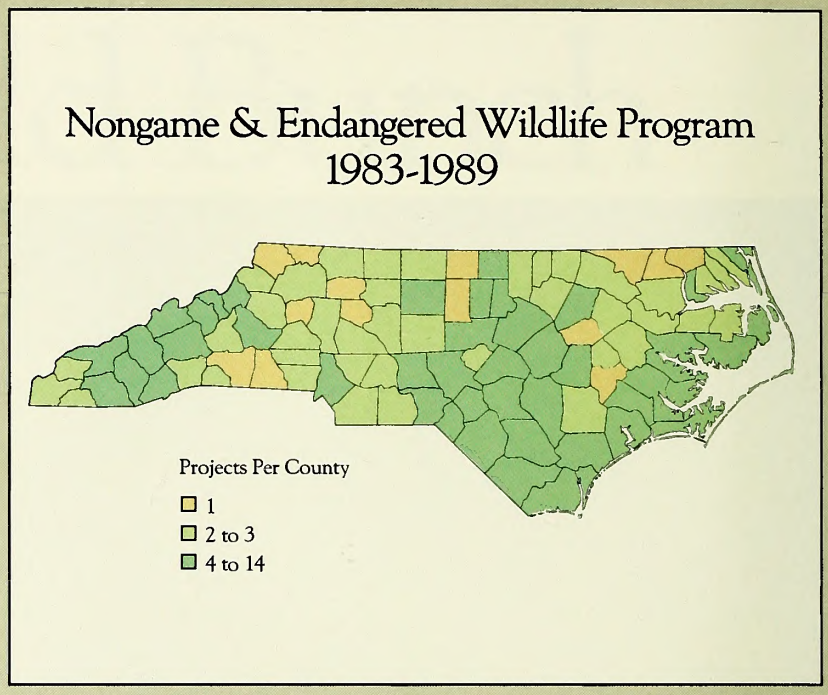
The Nongame Wildlife Advisory Committee was appointed by the Wildlife Resources Commission before the Nongame and Endangered Wildlife Fund was created in 1983. At first, the committee had a sort of quasi-formal status. Then in the 1987 General Assembly, the Wildlife Commission sponsored the North Carolina Endangered Species Act, which legally empowered the Nongame Wildlife Advisory Committee to advise the Wildlife Commission on all matters regarding the conservation of nongame and endangered wildlife.

The 17 men and women of the committee are chosen from a variety of wildlife-related fields. The Commission has made a "real attempt to make the committee diverse, both geographically and in terms of background," says Peter Weigl, professor of biology at Wake Forest University and the current chairman of the committee. "All of the people on the committee are knowledgeable about and very active on behalf of wildlife."

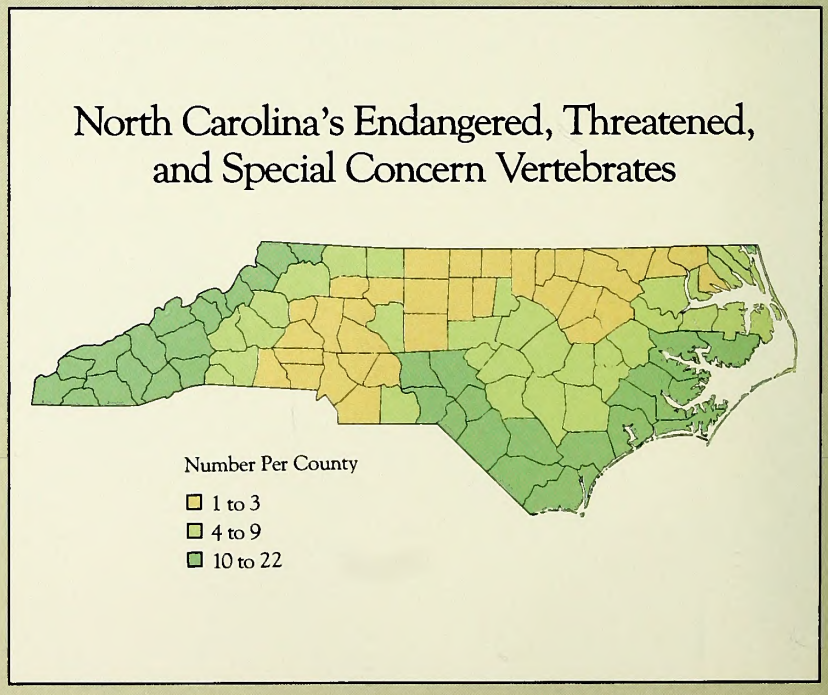
One of the main duties of the committee is to develop a list of North Carolina animals that are endangered, threatened or of special concern. And since its recommendations, when adopted by the Wildlife Commission, have the force of law, the undertaking represents a solid victory for wildlife conservation.

"Back in the 1970s," says Weigl, "the Museum of Natural Sciences in Raleigh had a conference on rare and endangered species in North Carolina that generated a list of species. But the museum had no real authority. You can say something is rare, but unless you have the power to protect it, it doesn't make much difference." Today, the Endangered Species Act gives wildlife enforcement officers the authority to arrest illegal collectors of bog turtles, green salamanders and other species appearing on the list.

The emergency protection given the turtle and salamander in 1989 was unique. The process of listing a species usually begins with recommendations by experts from a variety of scientific councils organized around specific wildlife groups (birds, mammals, reptiles and amphibians, etc.). The councils coordinate closely with the state Museum of Natural Sciences and other state and federal agencies



***Projects have been** funded by the Nongame and Endangered Species Wildlife Program where the greatest needs exist. The program is supported by funds generated by the state tax checkoff and other contributions to the Nongame Fund. Bald eagles, sea turtles, red-cockaded woodpeckers, northern flying squirrels, alligators and piping plovers have been among the species studied.*



***Both federal and** state laws protect species that are listed as endangered, threatened and of special concern. The map above shows the North Carolina distribution of vertebrates listed by the federal government and proposed by the state. By April 1990, the Wildlife Resources Commission will have approved a partial list consisting of mammals, birds, amphibians and reptiles. By 1991, the list will be complete.*

to decide on the status of rare species — whether endangered, threatened or of special concern. At that point the advisory committee takes over and makes final recommendations to the Wildlife Commission. By the summer of 1990, more than 200 species will be on the state list.

Once the species have been listed, protection efforts can take place, including the identification and protection of critical habitats. As the list grows longer, so will the need for technical guidance to landowners, developers and state, federal and local governments. Biologists with the nongame program will have to make annual surveys to update the information about the distribution, biology and habitat status of our rare wildlife species.

The state list of endangered species is certain to change the nongame program's emphasis in the future. When the program began in 1983, the focus was on the bald eagle, peregrine falcon and loggerhead sea turtle, species on the federal government's list of endangered species. To appear on the federal list means that a species is vulnerable in a significant portion of its United States range. As the state program developed, the focus was widened to include other federally listed species — the northern flying squirrel and spotfin chub in the mountains; the red-cockaded woodpecker, Cape Fear shiner and Tar River spiny mussel in the Piedmont and Sandhills; and the alligator and piping plover in the Coastal Plain.

During the past few years, however, the nongame program has received enough funding to begin working with species that may not be endangered nationwide but are endangered in this state — species like the glossy ibis and other waterbirds threatened by loss of habitat. "The reason for the choice of the original species was that there's been little money available for projects other than what the federal government thought was important," says Weigl. During the past few years, the nongame program has finally had sufficient funding to begin working with species important to North Carolina's natural history. "We don't have a lot of money for the major research and conservation work needed, but at least we've got money for our staff biologists to begin the study and to give some protection to these species."

Although protecting endangered species remains its most important work, the committee has been moving in a number of other directions, including education. The committee has recommended that the Commission provide funding from the Nongame and Endangered Wildlife Fund for Project WILD, the Commission's environmental-education program. It has also funded training and field trips for wildlife enforcement officers to help them identify state-listed species and habitats that need protection. In 1989, its program of small grants to scientists and educators funded a total of $25,000 to 16 projects. And the committee is making alliances with other conservation and environmental groups, hoping to serve as an umbrella organization for the conservation community.

"That's one of the things I'm most concerned about," Weigl says. "What we're trying to do is get some degree of communication between some of these groups so that you have everyone working together, and so you don't have a lot of duplication of effort." He mentions with satisfaction the relationships forged by the committee and the nongame program with the Museum of Natural Sciences, the Natural Heritage Program, The Nature Conservancy and the U.S. Fish and Wildlife Service.

Some of the fruits of this closer coordination are already in place. In 1987, The Nature Conservancy and the nongame program agreed to share a data base called the Vertebrate Characterization Abstract. This powerful data base contains basic scientific information about every vertebrate in North Carolina — habitat requirements, reproductive requirements, legal status, food requirements and distribution.

"It's composed of two levels of information," according to Joe Jacob, director of science for The Nature Conservancy's southern region and a member of the advisory committee. "Global information — data about wherever the animal is found — and state information. We agreed to give the Commission updated global information every year in exchange for which the Commission agreed to fill in the state information about the animal. Once a year, in theory, we could exchange our data."

Another cooperative agreement with the state's Natural Heritage Program will allow the exchange of data about the distribution of the rare animal species in the state. "We have something like 2,500 existing records of locations of rare animals," says Chuck Roe, director of the Natural Heritage Program and also a member of the advisory committee. "All of that will become available to the Commission to use."

One of the important future tasks for the nongame advisory committee is to put the nongame program on a more secure financial footing. "We're a very small-scale program," says Weigl. "We're trying to find a permanent source of money because tax checkoffs in most states eventually have gone down. In North Carolina, contributions to the Nongame Fund through the income tax checkoff have continued to increase ($440,062 from July 1988 through June 1989). But if they decreased, my guess is we'd have to reduce the program."

"We've been very lucky to date," adds Jacob, who has been heading a group looking into improving the program's finances. "But an ounce of prevention is worth a pound of cure. The other thing is that as much money as we've gotten from the checkoff, it's nowhere near enough to protect the resource. We want to add to the funding."

The ultimate goal of the Nongame Wildlife Advisory Committee is to maintain healthy populations of our nongame and endangered species. It will take time, money and commitment from citizens, businesses and governments. But if the nongame program is on a sure course — and most observers think it is — then the advisory committee can take a good part of the responsibility for that.

Who Cares for Wildlife?

NORTH CAROLINA NONGAME & ENDANGERED WILDLIFE FUND

You do, of course, and that's why you may like to know you can earmark a donation specifically to help nongame and endangered wildlife. Make your contribution directly or through the income tax checkoff to the Nongame & Endangered Wildlife Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, NC 27604-1188.

For more information on ongoing research and management supported by the nongame fund, see the articles on colony nesting waterbirds and northern flying squirrels in the January and February 1990 issues.

A Fish for all Seasons

What white bass lack in size, they more than make up for in spunk. Here's how to catch 'em year-round.

written and photographed by Pete Elkins

Every white bass takes me back to the first one. Fishing was simpler those 20-plus years ago on Lake Hickory. If my high school fishing buddies and I wanted to catch largemouth bass, we cast a stiff black plastic worm rigged on a weedless jighead with a second weedless hook protruding from the rear of the worm.

One day, while fishing one of these rigs across a long point, I noticed another angler anchored in the middle of the cove beside the point. The lone angler would make a long cast with an obviously heavy lure, wait a few minutes for the lure to settle, then quickly crank the shiny lure back toward his boat. Few of his casts were making the voyage back without an interruption.

After watching him catch more than a dozen fish, I lost interest in fishing the black worm. One of the great advantages of being a naive teenager is the lack of inhibitions. Therefore, I just paddled over to the lucky angler and asked what he was catching and how. Instead of telling me to mind my own business, he showed me a live well full of white bass. While I admired the fish, he handed me one of the magic lures. Back then, I didn't recognize it as a "Little George" tailspinner, a lure already on its way to becoming a white bass angler's standard.

Within five minutes after knotting the compact lure to my bass rig, a muscular white bass in the 2-pound class introduced itself to "Little George."

That marked the beginning of an angling fascination with the Morone clan — the white bass being one of the most widely distributed members. Along with the yellow bass, white perch and striped bass, the Morones are true bass, unlike the more glamorous largemouth, smallmouth and spotted bass, which are actually sunfish.

While a white bass cannot match a largemouth or smallmouth in aerial antics, only hybrids or striped bass can equal the strength of a white's initial surge after belting a lure. I've encountered mixed schools of white and largemouth bass hitting identical lures, and it's easy to tell the difference between a 2-pound largemouth and a 1½-pound white — the white bass pulls harder every time!

White bass are also much more gregarious than largemouths. Find one white bass and there are almost always a lot more in the vicinity. Also, whites are not finicky feeders. There are some occasions when white bass are picky, but more often than not, the problem arises from unusually tiny forage or selective feeding during a mayfly hatch. Generally, if you can get a small lure within sight of a white, you'll catch it.

The current world record is held by a monster 1 ounce shy of 6 pounds, but an average white in North Carolina will weigh around ½ to 1 pound, and a 2-pounder is a very nice catch. Generally, a 10-inch white bass will weigh ½ pound. At present, Fontana Lake seems to be yielding the largest white bass in North Carolina.

My fascination with white bass and their cousins derives largely from their willingness to play the game in all seasons, and spring is a good time to get started.

At dawn angler fishes for white bass from the bank of a heated "hothole" near an electric power plant on a large Piedmont lake. Such spots regularly attract white bass in late winter and early spring.

***For their size,** few fish are stronger than white bass and they'll strike a wide variety of small jigs, spoons, spinners and plugs. Wading tributaries in the spring when white bass spawn is one of the most exciting ways to catch these fish.*

It's no surprise that the easy pickings of spring are related to the spawning urge. When water temperatures reach approximately 60 degrees Fahrenheit, whites spawn in shallow tributary streams, or along gravel or rocky flats if there are no suitable tributaries. In most of our reservoirs, the spawning concentrates in headwater areas in the tailrace of upriver dams. While the actual spawning requires a water temperature range of 58 to 64 F, male white bass may begin moving toward spawning areas while water temperatures are still in the low 50s.

Once this movement begins, white bass are vulnerable to a variety of angling tactics. For maximum enjoyment of this lightweight battler, light spinning tackle primed with 4- to 10-pound line is perfect. For long rod fans, spawning whites can be taken with streamer flies in shallow tributaries, and no special fly gear is needed. For the heavier water below dams and in fast-flowing rivers, fast-sinking shooting heads make the fly fishing game more productive.

Live bait is deadly for spawning whites. While many anglers use minnows below a cork or on a slip sinker-rig, live threadfin shad are unbeatable. White bass never ignore a lively 2- to 3-inch threadfin hooked lightly through the lips or nose cartilage and drifted along the bottom. Live shad are normally presented on a typical, but scaled-down, live bait striper rig, with the bait on an 18- to 24-inch leader below a slip-sinker sized to match current and depth conditions. Spawning whites in fast-flowing current tend to seek eddies or edges offering some protection from heavy current. Sandbars, points, small protected pockets and pools deserve angling attention.

Artificial lures are equally effective for spring white bass. The venerable "jig and cork" rig is standard—just a small maribou or plastic grub jig fixed below a cork. Slip-corks are handier if the jig is positioned more than 4 feet or so below the jig. Merely cast the rig out where the whites are supposed to be and work it back toward you. The beauty of this simple rig is the depth control during the retrieve, an economical consideration over rough bottoms.

Many anglers prefer to cast a jig or grub quartering upstream, then "swim" it through productive areas without a cork, and ⅛- to ¼-ounce jigs are most effective.

Lure colors should match the dominant forage. In Tar Heel waters, forage is usually shad. Thus, silver or chrome lures are almost always good. White or chartreuse maribou, bucktail or plastic grub bodies are also good. One particularly good plastic lure is a 2- to 3-inch shad-toned "Sassy Shad" with a ¼-ounce jig head. A slow, steady retrieve is normally most effective.

One overlooked white bass lure very effective in flowing water is a shad dart. More commonly associated with hickory or white shad in waters like Pitchkettle Creek or the Tar River, these compact slant-faced jigs are white bass killers in moving water. I like to rig the darts in tandem by tying a blood knot with one end of the knot left about 6 inches long to tie on the "dropper" dart.

In really murky water—not uncommon during the early spring river runs—a small crankbait like a Deep Wee-R or some of the newer ultra-light diving plugs in the ⅛-ounce category can really do wonders. The tight wiggle and internal rattle of these mini bass lures draw thudding strikes. Vibrating lures like Rat-L-Traps, Hotspots and the like also produce a lot of springtime white bass.

Some of the most exciting springtime action occurs away from the traditional tailrace areas. When conditions are right, usually in late March or early April, spawning white bass will swarm up tiny tributary creeks into water so shallow that their dorsal fins are exposed. Casting tiny jigs on 4-pound spinning gear results in memorable action. The best approach to these thin-water fish is often by wading.

Upon completion of their spawning rituals, white bass move back to deeper water in the main lake or river. Fortunately for enthusiastic anglers, threadfin and gizzard shad fry are hatching about the time the white bass begin this post-spawn movement. This keys the beginning of jump fishing will last throughout the summer season and even into the fall months. As exciting and easy as the spring fishery is, it pales beside the topwater magic of jump fishing. You sit there, motor off, rod ready, hand poised near the ignition switch waiting, watching for that first frantic skitter of shad on the surface. There! The outboard fires as you race toward the suddenly frothing surface and make your casts. It's not uncommon to see schools of feeding white bass covering 50 to 100 yards of surface. There are reliable reports of acres of surface-crashing whites. Best of all, white bass tend to stay on top a bit longer than other species. Even if they descend, they tend to pop up again soon in the same neighborhood.

Unlike striped bass and largemouth, surface-schooling whites are often cooperative fish. Cast a lure within range without spooking them, and you have a strike. Successful jump fishing requires a reliable boat, good vision (binoculars are useful), and the ability to make a long cast. Whites stay on top longer than other species, but it's still an ephemeral situation at best.

The only secret to lure selection is to match the rough size of the forage, which is small. Hence, the popularity and productivity of compact lures like the Little George, Hopkins spoon, Rat-L-Trap and Gay Blade. These lures are all sinkers. The Little George and Gay Blade sink rapidly, making it important to gain lure control as soon as the lure hits the water. A moderately paced retrieve, punctuated by an occasional pause, will usually do the trick.

One good tactic to use with a ¾- or ½-ounce Hopkins spoon is to cast beyond the target, skitter the spoon across the surface, then let it drop on a tight line over the fish.

White bass love topwater lures, and my favorite for schooling whites is a transparent Tiny Torpedo retrieved with short twitches. The weighted Cordell Near Nuthin' casts forever, and the clear model is a killer. A salt-water popping cork trailed by a short leader and small popping bug or jig is also devastating when chugged along the surface. Another old proven variation on the popping cork is a surface chugger like the ancient Lucky 13 or ½-ounce Pop-R trailing a short mono leader with a jig or other small lure. The big plug provides casting weight and chugging attraction while the small trailer does most of the catching. For that reason, a lot of anglers remove the hooks from the plug. A popping cork is just as effective with less hassle.

Finally, a small metal lure with a short bucktail trailer called an "ice fly" is particularly popular in some North Carolina waters.

As good as the surface action can be, the fish inevitably dive. When that happens, you can still catch a few more by vertically jigging with a Hopkins in the area where the fish were surfacing. A chart recorder or good flasher will pinpoint the exact depth of the retreating fish. Keep an eye on the horizon, however, because the school—or another—may suddenly reappear hundreds of yards away.

Most of this summertime jump fishing is an open-water business, with suspended shad schools providing a sort of movable structure for the white bass. However, early and late in the day, whites may also corral hapless shad over shallow flats or submerged islands, or even in the backs of coves. Cove action tends to intensify as summer gives way to fall. Indeed, the best surface action of the year may actually take place as the water temperature drops to the 50 to 60 F range. When that happens, large shad concentrations migrate from open lake areas into the mid and back portions of the large creeks and coves. White bass, as well as largemouths, shadow

Big stringers *of white bass aren't uncommon because they travel in large schools. If you catch one, you'll probably catch more in the same spot. In winter, that may mean jigging deep water, but in summer you often find schools feeding on the surface.*

this migration.

In addition, this shallower and more explosive surface schooling of autumn attracts fewer boats and fewer boats mean fewer spooked surface schools.

Some canny autumn anglers showed me an interesting trick for whites (and largemouths and hybrids, all of which tend to join forces more in the fall for a combined pillage of shallow shad) schooling over shallow flats and points during the late season period. The method involves using a Hopkins spoon like a plastic worm.

The first time that I tried the method was typical. Casting the Hopkins 75 toward shallow water, I let it sink to the bottom in 3 to 6 feet of water. Maintaining a tight line, I lifted the rod tip, moving the spoon gently off the bottom like a plastic worm, then lowered the rod tip back to the starting point. As the spoon settled back toward the bottom, the line jumped slightly from a strike. Caught off guard, I missed that fish as well as the next three.

Finally realizing the importance of maintaining the lowest rod angle and tightest line possible while the spoon settled, I began to catch white bass on every cast. Since then, the method has proven the most reliable of all for shallow-schooling fish not actively taking topwater lures. As you might guess, the method works best in relatively clean-bottomed areas. If there are stumps, rocks or other solid bottom cover, the spoon snags too often for consistent success.

Hopkins and other so-called "structure" spoons are at their most effective during the final chapter of the white bass season. Once surface temperature drops into the 40s, white bass tend to suspend over deep open water or maintain close contact with the bottom in 18- to 40-foot depths. In North Carolina, as in the spring and the rest of the year for that matter, live threadfin shad head the list of preferred bait. Shad are a bit more difficult to collect during the winter than spring, but a good hand with a cast net can come up with the essential ingredients. Since the whites are deep during the winter, the telling tactic is to locate the schools with a depth finder and present a lively shad right in front of their chilled noses.

As good as live bait can be in the winter, vertically jigged spoons are equally effective, and a lot less trouble. If there is a fish designed to perfect one's vertical jigging skills, it's the white bass. Whites are enthusiastic about jigged spoons in deep cold water. If they miss, they obligingly strike again until solidly hooked. The chart will tell you how deep they are if they are suspended more than several feet off the bottom. If so, strip line off your reel to lower the spoon in 2-foot strips until the spoon is at or slightly below the level of the fish. A short, snappy jigging action is usually best for white bass. If largemouth crash the party, reduce the jigging pace.

If whites are being coy, try an old trick that Texas and Oklahoma white bass anglers developed. Tie a small bucktail jig on a short dropper line a foot or so above the jigging spoon. Sometimes the whites will show a decided preference for the little upstairs lure over the spoon itself. It's also common to connect with doubles while jigging this tandem rig. Incidently, doubles are an argument against this system because after the novelty wears off, you'll discover that two hooked fish don't fight as well as a single.

It's important that anglers be able to tell the difference between white, striped and hybrid (Bodie) bass because creel and size limits differ.

There are some exotic ways to tell the difference, such as tooth patches, dorsal fin separation, and length and distinctness of the lateral stripes, but I think the easiest way is to compare overall body shape between the white and striped bass. The white bass is always chunkier in appearance. Hybrids skew this body shape test a bit, but a hybrid's broken stripe pattern seems consistent. I've seen a few broken-lined stripers, but their longer, more streamlined body shape gives them away on a second look.

Finally, one of the best things about white bass is that they are tasty, especially if you remove the strips of darker red tissue along the lateral lines after filleting and skinning. Then, try them in a chowder or baked with Italian dressing and you'll go back for more. ☒

Oldest Trees East of the Rockies

Ancient Cypress Stand on Black River Saved

Written and Edited by Vic Venters

You're in a cypress swamp. Put your paddle down, stop the canoe, look and listen. Only tiny waves lapping at knobby cypress roots break the silence, their rhythmic tick fading like a slowing watch. Great trees jut from the black water; overhead, thin rays of light knife through branches heavy with Spanish moss. It's dark and quiet in here, like a dimly lit cathedral.

We're fortunate to have cypress stands like this in North Carolina — some of them older than the medieval cathedrals of Europe. Thanks to the North Carolina Nature Conservancy, a stand of 1,000-year-old cypress trees in the Black River swamp will have a chance to grow another millennium.

This winter, the Nature Conservancy signed a conservation easement agreement with a pair of Bladen County landowners to permanently protect 23 acres of forest in the Black River swamp. The property, which holds bald cypress trees dating back to at least 364 A.D., is considered to have on it some of the oldest trees east of the Rocky Mountains.

"I was astonished to find out that I had such old trees on my property," said T. Nelson Squires, the landowner who, with his wife, signed the easement. "Their age makes me feel very humble." These trees are noteworthy because of the rarity of undisturbed old-growth forests in the East and their value for scientific and educational purposes.

The tract is part of a 2,000-acre area that the Conservancy eventually hopes to see as a nature refuge. This 10-mile stretch of swamp along the Black River contains the largest known concentration of old-growth bald cypress. The trees were probably spared the axe because their old age diminished any timber value of the wood, said Frederick Annand, the Conservancy's associate director. Although development pressure on the river is minimal now, second-home building along high ground on the banks has been increasing in recent years.

The Conservancy is currently negotiating with various landowners to protect the sensitive tracts along the river. About 40 individuals and companies own the land needed to create a preserve. "So far, our efforts have been encouraging," Annand said. "Many of the families have owned the land for generations and are sympathetic to preservation efforts." To protect the swamp, the Conservancy hopes to get landowners to enter into conservation easements.

These easements are voluntary agreements from landowners that allow the landowner to retain title to his lands, as well as allowing boating, hunting and fishing rights. However, easements limit development in exchange for deductions in both state and federal income tax for the full fairmarket value of the gifts.

The North Carolina Nature Conservancy is a chapter of The Nature Conservancy, an international nonprofit conservation group. Since 1977, the North Carolina Nature Conservancy has protected over 320,400 acres in the state. For more information on the Conservancy's easement program, write North Carolina Nature Conservancy, Carr Mill Mall, Carrboro, N.C. 27510.

NCWRC

Black River Beauties: *Thanks to the efforts of the North Carolina Nature Conservancy, a stand of ancient 1,000-year-old cypress trees in the Black River swamp has been preserved. The conservation group and a pair of Bladen County landowners signed a conservation agreement that will permanently protect some of the oldest trees east of the Rocky Mountains.*

Calendar Of Events

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before travelling to an event. Listings for the calendar should be sent at least four months in advance.

March 2-4
The Dixie Deer Classic at the N.C. State Fairgrounds in Raleigh features hunting and sporting equipment, hunting seminars, taxidermists and taxidermy exhibits. For more information, contact Dixie Deer Classic, Wake County Wildlife Club, P.O. Box 12202, Raleigh, N.C. 27605, or call (919) 833-5550.

March 17
The N.C. Herpetological Society will hold their spring meeting jointly with the Eastern Seaboard Herpetological League on the East Carolina University campus in Greenville. Anyone interested in reptiles and amphibians is invited to attend. For more information, contact the N.C. Herpetological Society, N.C. State Museum of Natural Sciences, P.O. Box 27647, Raleigh, NC 27604-1188 or call (919) 733-7450.

Fond Memories and Silver Fish

Herring Days Are Here Again

I still remember how the light used to hurt my eyes when my father would switch it on at 4 o'clock in the morning. But I didn't mind a bit — it was time to go dip herring.

Outside, the sun was beginning to warm the cool spring sky, the dogwoods were beginning to bloom and the herring were starting to spawn. First light would find us in a homemade wooden boat up one of our favorite creeks in the eastern part of the state. From the surrounding swamp came the sound of churning water as thousands of herring went about their business of spawning in the black swamp water.

As the day grew brighter, the herring would return to the creek in search of deeper water. As they did, our bow net would fill with the sparkling fish, the herring looking for all the world like silver dollars as they tumbled down the net. After filling a couple of stands, I'd be off to school. Later in the day, I might find a silver scale stuck to the back of my hand. In my mind, I'd be on the water again.

That was 25 years ago. Today the herring don't come in the numbers they did when I was young. During the 1970s, there was a sharp decline when foreign trawlers stood 10 miles offshore and filled their hulls with fish. Since the fishing limits have been extended to 200 miles offshore, the herring have been making a comeback.

You can still go down to the creeks of eastern North Carolina and find the banks covered with people when the herring are running. Some will be cooking fresh fish and cornbread over an open fire. Others will be talking about how their families lived off herring and sweet potatoes in the hard days of the Depression. Someone will comment on how he's seen a greedy fisherman sink his boat by overloading it with fish. Still others just come to eat and watch all of the excitement.

It's that time of year again when the black waters down east flash silver. The only difference is that I'm the one that's switching the light on now, and saying, "Come on, it's time to dip herring."

Terry Rose
Windsor, NC

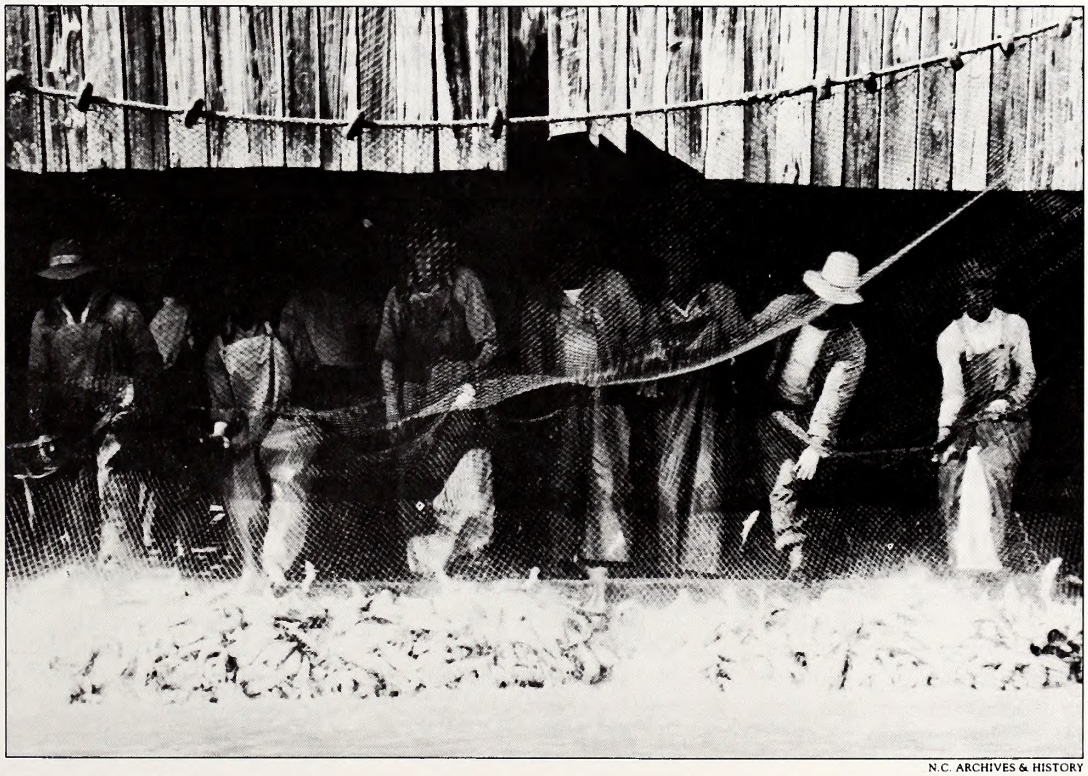
Editor's Note: *In early spring, you can find herring returning from the ocean to spawn in most of eastern North Carolina's rivers. Herring netting, or "dipping" as it is locally known, is a longtime tradition in many of these watersheds, especially around the Roanoke, Tar and Neuse rivers.*

Decoy Show Slated for Wilmington

Proceeds Help Ducks, Preservation

The Historic Wilmington Foundation and the Carolina Decoy Collector's And Carver's Association are teaming up to sponsor an antique decoy show that will benefit both waterfowl and Wilmington's historic preservation efforts. Over 35 exhibitors are expected to participate in the three day decoy show, which will take place March 30 through April 1 at St. Thomas Church on Dock Street in Wilmington. Admission will be $5, half of which will go to support Ducks Unlimited and the other half to the Historic Wilmington Foundation.

In conjunction with the show, the Historic Wilmington Foundation will also present a cocktail party and private collection viewing on Friday night, March 30. The event will also feature a lecture by Jackson Parker, a noted decoy expert. Ticket prices for this event are $75 per person and proceeds will benefit the preservation work of the Historic Wilmington Foundation. For more information, contact the Historic Wilmington Foundation, 209 Dock Street, Wilmington, N.C. 28401 or call (919) 762-2511. Information and tickets may also be purchased from the Carolina Decoy Collector's And Carver's Association, P.O. Box 651, Wrightsville Beach, N.C. 28480.



N.C. ARCHIVES & HISTORY

The Good Old Days: *Herring aren't quite as plentiful today as they were when this picture was taken near Jamesville on the Roanoke River in the early part of this century. Nevertheless, eastern North Carolina's early spring tradition of herring dipping continues, as reader Terry Rose of Windsor recalls.*

Tar Heel Wildlife Luckier than South Carolina's

Hugo Leaves Wildlife Habitat in Shambles

It's been six months since Hurricane Hugo stormed ashore throwing a $7 billion temper tantrum, and both man and wildlife are still picking up the pieces. In addition to causing billions of dollars in property damage in the Carolinas, Hugo — with its 125-mph winds and 15-foot storm surge — also destroyed priceless wildlife habitat in both states.

It looks as though North Carolina got off comparatively lightly, however. Unlike the Palmetto state, which suffered large fish kills and widespread wildlife habitat destruction, damage to North Carolina was much more localized. While Hugo downed a lot of trees — especially mature hardwoods — in the western Piedmont and northern mountains of North Carolina, the effect on hardwood-dependent species such as squirrels and turkeys was softened by the patchy nature of the destruction. While there may be some losses to those species in specific locations, the scattered clear-cutting effect of Hugo's winds could actually help small game such as grouse and quail as young growth replaces the older, downed forest. Luckily, North Carolina didn't suffer massive fish kills either, although boating-access areas and marinas were temporarily damaged on several western Piedmont and mountain lakes. Some streambed scouring occurred on trout waters and some young-of-the-year fry could have been washed away, say fishery biologists. However, damage to trout streams, if any, should be limited to localized areas.

Considering the magnitude of the storm, it appears North Carolina's wildlife resource was quite fortunate, especially by comparison to South Carolina's losses. Some of that state's casualties include:

- Losses among the endangered red-cockaded woodpeckers in South Carolina's Francis Marion National Forest are estimated as high as 75 percent. Before the hurricane, the Francis Marion hosted about 20 percent of the known population. The hurricane destroyed most of the cavity trees woodpeckers need for nesting.
- Turkey and squirrel populations in affected areas are expected to plunge because of widespread devastation of mast-producing mature hardwoods.
- Forty percent of South Carolina's bald eagle nests were damaged. Wood duck populations may also be hurt because of severe losses to nesting trees.
- Millions of fish were killed in South Carolina's coastal rivers. The Black River lost 3 million fish, the Santee River lost 1.6 million, the Lynches River lost 158,000, the Little Pee Dee River lost 41,000, and the Waccamaw River lost 21,000. In response, South Carolina has had to restock hundreds of thousands of sunfish fry in an effort to restore the fishery.

Cast Us A Line...

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit any correspondence. Please send to Letters Dept., *Wildlife In North Carolina*, 512 N. Salisbury St., Raleigh, N.C., 27611.

MELISSA McGAW

KO'd by Hugo: *Although some of North Carolina's wildlife habitat was battered by Hurricane Hugo in September, biologists expect little long-term damage to the state's wildlife. Unfortunately, the same cannot be said for South Carolina, where extensive fish kills and habitat destruction occurred.*

Bluebirds Still Need Help

Dear Editors:

I am concerned that your readers may have gotten a false impression of the status of North Carolina's eastern bluebird population as a result of information that did not appear in the article "Wanderers in Trouble" in your November issue. The increase reported for bluebirds (up 369 percent over 20 years) does not represent an actual increase above normal population levels but rather represents a population that is still recovering from a population crash that occurred in the late 1950s and early 1960s due to a series of abnormally severe winters. I realize that this disaster is not apparent from the analysis of data from the Breeding Bird Survey on which the article was based because this survey only dates back to 1966. However, it is very noticeable in the Christmas Bird Counts that have been conducted over the last four decades in this state.

It is important that we continue our bluebird conservation efforts. I hope we have not lost current or future bluebird conservationists.

Linda D. Phillips
Research Chairman
N.C. Bluebird Society

High Waters Slow Efforts

Endangered Chub Reintroduced to the Great Smokies

High water in North Carolina's mountains has managed to slow down — but not stop — efforts to reintroduce the threatened spotfin chub to the Great Smoky Mountains National Park. This past fall, biologists transplanted 48 of the rare spotfin chubs from the Little Tennessee River above Fontana Lake to Abrams Creek in the park. Normally, 250 chubs would have been transferred, but last year's excessive rainfall kept water levels high through the fall and prevented biologists from netting the additional fish. Biologists hope to be back on the streams in May to continue the effort. This is the second year of a five-year project to re-establish a spotfin population in Abrams Creek.

Spotfin chubs are among the rarest fish in the Southeast. Found outside of the state only in Tennessee and Virginia, the fish was once common throughout the Tennessee River watershed. In recent years, its range has retreated from 12 major Tennessee River tributaries to four, as the chub has become a victim of increasing water pollution and reservoir construction. In North Carolina, it's now found only in the Little Tennessee River.

Because the water quality of Abrams Creek is protected by the park, biologists hope to preserve the North Carolina gene pool even if the Little Tennessee River population is eliminated some time in the future. Spotfins — a federally listed threatened fish — were once native to Abrams Creek, and biologists believe that yearly transplants of 250 fish will provide for enough genetic diversity to re-establish a healthy population.

The reintroduction project is a joint effort between the N.C. Wildlife Resources Commission, the U.S. Fish and Wildlife Service, the Tennessee Wildlife Resources Agency, Great Smoky Mountains National Park and researchers at the University of Tennessee.

In addition to transplanting fish, biologists have also discovered a very rare freshwater mussel in the Little Tennessee. The mussel — known as the Appalachian Elktoe — grows to about 4 inches and is a candidate for endangered species status.

The N.C. Wildlife Commission's effort in this reintroduction project is being financed by the Nongame and Endangered Wildlife Fund. Each year, citizens contribute to the fund by checking the block on their state income tax form to designate any or all of their refund to the Nongame and Endangered Wildlife Fund. Monies from the fund are used for a variety of projects helping nongame or endangered species.

KEN TAYLOR

Smoky Mountain Spotfins: *Efforts are continuing to reintroduce the endangered spotfin chub to Abrams Creek in the Great Smoky Mountains National Park. High water slowed work last winter but researchers expect to be out in May to continue restocking the chubs. The program is a joint effort between state and federal agencies, with the N.C. Wildlife Resources Commission's work being funded by the Nongame and Endangered Wildlife Fund tax-checkoff program.*

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Status on December 31, 1989

	Numbers Sold	Revenue Received
Lifetime Sportsman's License	48,628	$17,784,438.92
Lifetime Hunting License	615	168,920.74
Lifetime Fishing License	3,746	839,244.01
Lifetime Subscriptions to Wildlife in N.C.	1,811	247,860.26
Contributions	—	165,322.54
Fund Total	54,800	$19,205,786.47
Total Interest Earned	$5,128,616.43	

Maintenance Will Improve

Adopt an Access Area

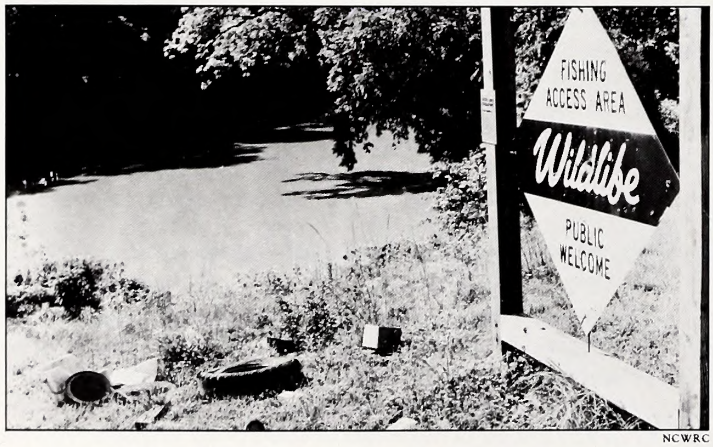
North Carolina's boat ramps may get some extra attention when the N.C. Wildlife Resources Commission implements its new Adopt an Access Area program this spring.

Under the program, designed after the state's Adopt a Highway program, individuals or conservation groups may choose one of the state's 157 boating-access areas to help keep clean and to identify maintenance needs. Volunteers will also help alleviate vandalism on more remote areas by reporting misuse to the Commission.

"Our technical staff is responsible for keeping access areas clean so an adopting group would really be helpful in letting us know when maintenance is needed," said Fred Harris, chief of the Commission's Division of Boating and Inland Fisheries. "For example, if a board is missing on a dock, the adopter could inform us and we could get someone there quickly to make repairs. We want to get groups or individuals to adopt those access areas in the state that aren't used as often as others. That will help us to keep up better with maintenance."

The Commission will erect signs identifying the group that has adopted the area. Guidelines for the program will be developed by spring. For more information, write Adopt an Access Area, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

—Angela Dorman Hill



NCWRC

Help!: *The Wildlife Resources Commission's new Adopt An Access Area program should prevent vandalism like this. The program will encourage private groups to adopt and monitor access areas and keep them maintained. The program will be based on the state's successful Adopt A Highway program.*

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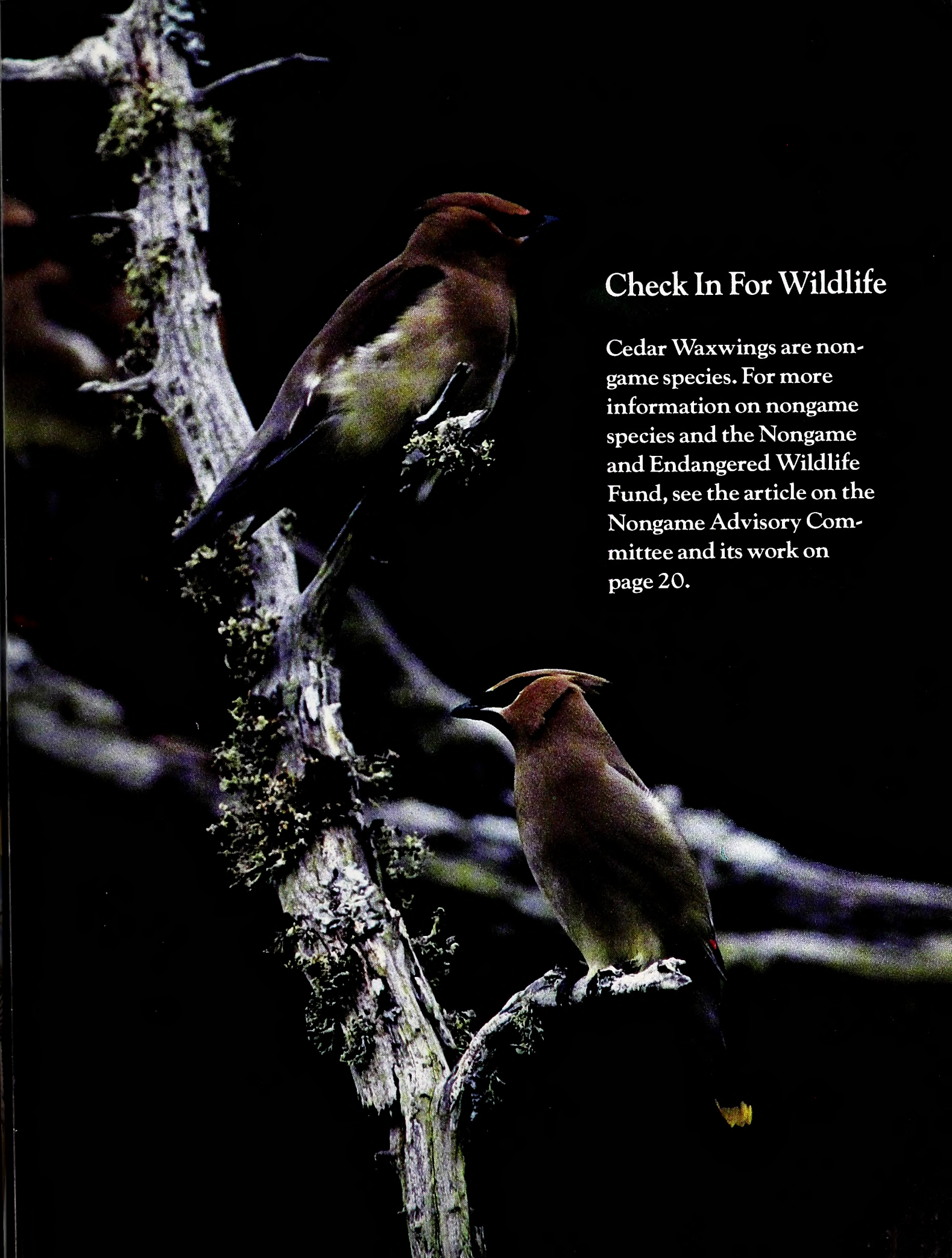

Check In For Wildlife

Cedar Waxwings are nongame species. For more information on nongame species and the Nongame and Endangered Wildlife Fund, see the article on the Nongame Advisory Committee and its work on page 20.

Headed To Sea

Danger awaits this hatchling loggerhead turtle as it leaves the beach through the glassy backwash of a wave and heads for the open sea.

LITHOGRAPHY BY EDWARDS & BROUGHTON COMPANY, RALEIGH, NORTH CAROLINA

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WILDLIFE IN NORTH CAROLINA

APRIL 1990

75 CENTS

Ollie Was Ahead Of His Time

by Jim Dean

Every town has its own quirky signature, and certainly that was true of my hometown in the '50s. One of our quirks was a mania for cars, and we were especially envious of one friend and his dazzling '57 Chevy convertible, the cleanest car in automotive history. As he cruised slowly between hamburger hangouts, we suspected he avoided the streets with overhanging trees (a bird might take a notion).

Ollie was another familiar fixture, and nearly as ubiquitous as that convertible. We would see him all over town, always pulling a kid's wagon or home-made cart piled high with flattened cardboard boxes or bundles of newspapers he'd collected. He usually wore a tie and a suit that looked about two sizes too big, and I seem to recall that he conducted animated conversations with himself. "Hey, Ollie," we'd holler, and Ollie would grin, wave and keep pulling.

LAWRENCE S. EARLEY

When his cart was full, Ollie would drag it through the streets — no doubt passing a certain shiny Chevy several times — until he reached the paper mill just outside town. There he would sell his cargo. Rumor had it that Ollie might be an eccentric millionaire with hard-earned dollars buried in every vacant lot in town, but if he was only a disadvantaged person trying to make do, he was also a Renaissance man who knew that one person's trash was another's treasure.

Nobody recycled much of anything in those days except diapers and cigarette butts, and hadn't since the end of the war and rationing. In recent years, recycling has again become, like Victory gardens, a matter of increasing necessity.

Today's recycling movement began to make modest headway about the time of the first Earth Day in 1970. Purely voluntary, it began among staunch environmentalists. People who cared put bricks in their toilet tanks to save water or made some other gesture that was largely symbolic at the time.

As you might expect, the biggest gains in recycling have been made by industry and government. For industry, the turning point has been the realization that some vital resources are running out and that costs can be trimmed and profits made by recycling certain things. Local governments rapidly running out of landfill space increasingly face an urgency that has convinced even the most recalcitrant.

That crisis and profit have been the biggest driving forces should come as no surprise since that is consistent with our reactive nature. We seldom respond adequately in any other way, and certainly not through voluntary efforts alone. That said, this is a good time to praise the significant progress in recycling made by industry and govenment, and continue to encourage more widespread and workable solutions.

Meanwhile, recycling continues to gain momentum among individuals, and every trip to the grocery is a litmus test. "Plastic or paper?" is the familiar question at the checkout counter. The implication is that environmentalists who care about the planet's future will choose biodegradable paper, while scorchers of the earth will chose the hated, indestructible plastic bag. If you choose plastic, it will probably do no good to explain to your silent, slit-eyed accusers that in today's lined landfills, paper is as indestructible as plastic, and there's certainly more of it. Nor is an impatient checkout line a good place to argue that paper bags are made of trees, and that most of those trees are products of monocultured forests that replace better wildlife habitat.

In other words, it ain't easy being a responsible citizen these days. (For what it's worth, truly responsible citizens would choose neither paper nor plastic. They'd bring their own reusable shopping bag.)

Even if many individual recycling efforts are still somewhat symbolic, they at least confirm our commitment and point the way. Everywhere, disposables are falling into disfavor. It's good to see people at work carrying their own coffee cups rather than using throwaways from the snack bar. More people are using dish rags instead of paper towels, and there has even been a modest return to cloth diapers — surely a supreme sacrifice.

Some families are also bundling their newspapers, separating glass and collecting aluminum cans because there are now more convenient places where these items can be dropped off for recycling. It's a good practice because the day is surely coming when such recycling will be required by law. At that point, we may be able to declare victory.

Until then, keep in mind that profit and crisis run in families, too. One friend, a bit short of cash, began gathering discarded aluminum cans and selling them. "By the end of the first year, I had a new color TV," he said.

Like my friend, I'll bet Ollie could have paid cash.

April 1990
Volume 54, Number 4

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *Ladybird beetles ring the blossom on a dandelion. More than ornamental, these beetles are ferocious predators that control many harmful insects. Photograph by Harry Ellis.*

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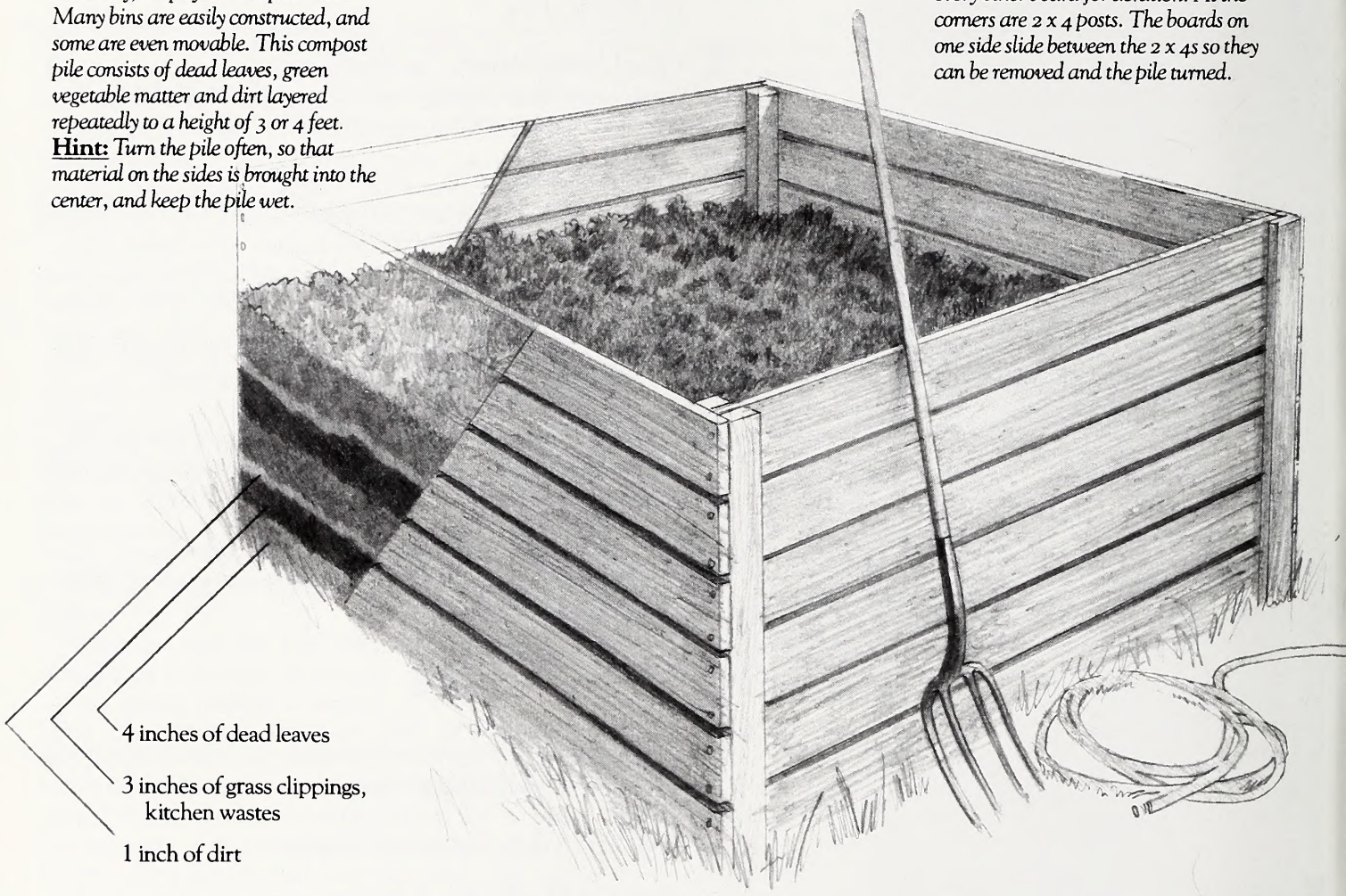
***Composting is the** natural way to enrich your garden soil. Use the kitchen scraps and yard wastes that are ordinarily thrown away. A bin, although not necessary, keeps your compost neat. Many bins are easily constructed, and some are even movable. This compost pile consists of dead leaves, green vegetable matter and dirt layered repeatedly to a height of 3 or 4 feet.*
Hint: *Turn the pile often, so that material on the sides is brought into the center, and keep the pile wet.*

***This compost** bin is about 4 feet square and 3 feet or more high. The sides are made of 1 inch by 6 inch boards, with half-inch spaces between every other board for aeration. At the corners are 2 x 4 posts. The boards on one side slide between the 2 x 4s so they can be removed and the pile turned.*



Building a Compost Pile

written by Lawrence S. Earley/illustrated by David Williams

"Man is of the earth and must tend it properly."
—J.I. Rodale

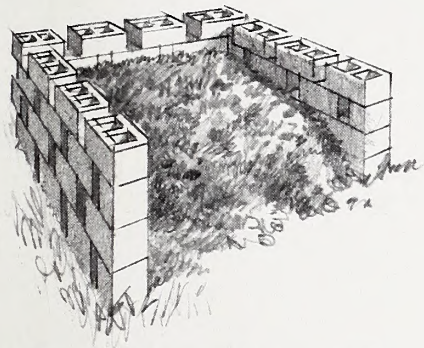
You can tend the earth properly and easily by building a compost pile in your backyard. Composting is the natural way to recycle the nutrients in yard and kitchen wastes. By placing kitchen and yard refuse in a pile and allowing it to decompose, we produce humus, a nutrient-rich substance that can enrich our gardens. It's nature's way of snatching life from death.

Composting is easy to do, as the following tips will show. For a complete guide to the subject, a reading of *The Rodale Guide to Composting* (Rodale Press, 1979) is in order.

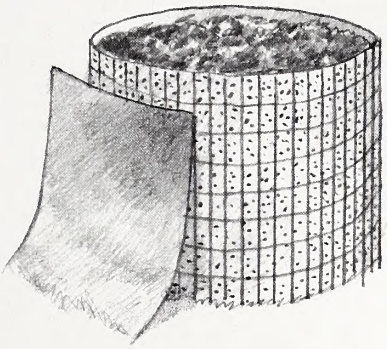
Why Compost? Mainly because it builds good soil and improves plant growth. Compost added to soil aerates it and improves its ability to retain water and nutrients. Composting prevents nutrients from being wasted in landfills and also helps prevent erosion. It decreases the use of chemical fertilizers that can leach into our drinking water.

What can I compost? Kitchen scraps (egg shells, vegetable remains etc.), dry yard wastes (dead plants, leaves, pine needles, weeds, hay, straw, sawdust) and fresh yard waste (grass clippings, hedge trimmings). Chipped wood can be used as a mulch or added to the pile.

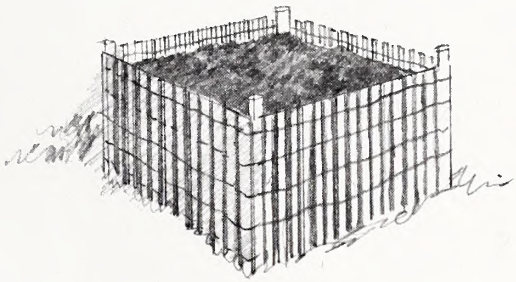
How do I compost? First, put down a layer of crossed branches, says Bibi Moore of the N.C. Botanical Garden in Chapel Hill. That will help aerate the pile. On top of that, heap alternate layers of dead leaves (4 inches high), green vegetables (about 3 inches of kitchen scraps, grass and hedge



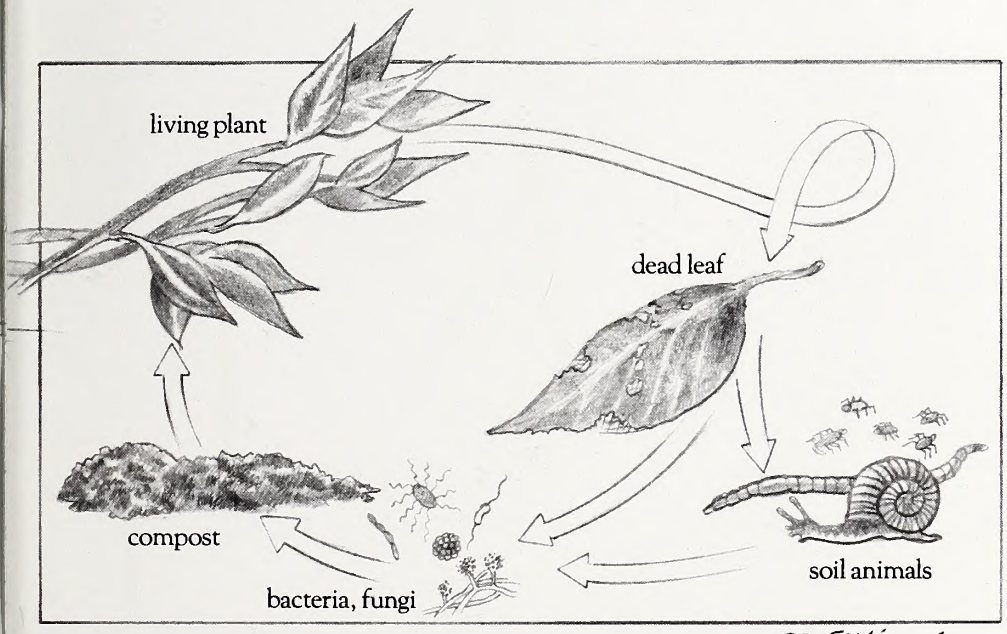
***Three-sided** compost bin is made of well-spaced concrete blocks, making the compost accessible and well-aerated.*



***Bin made of** tarpaper-lined wire fencing is light and easily moved. A cover can be constructed to protect the compost from too much rain.*



***Pre-fabricated** fencing material makes a neat and well-groomed compost pile. This picket-fence bin is also movable.*



***Rotting vegetable** matter produces nutrients that can be recycled by growing plants. A succession of mostly microscopic organisms attacks the dead organic matter, reducing it at last to a usable form (compost). Bacteria are the most important decomposing agents, but a working compost pile will also contain lots of fungi, snails, springtails, beetles and especially earthworms.*

clippings) and a light sprinkling of soil. Do this four or five times until your pile is about 3 or 4 feet high. Summer's a good time for building compost because there's plenty of garden and grass clippings available (keep a pile of last fall's leaves handy). You don't even need a bin to compost, says Moore, although having one will help keep your pile's sides nice and straight, aiding the process. In four to six weeks, your compost will be ready.

Keep the compost wet, but not too wet. If water drips out when you squeeze a handful of compost, it's too wet. Turning the pile every week or two is essential. It adds oxygen and increases its rate of decay. You can also speed up decomposition by shredding leaves and other yard waste.

What Goes on in a Compost Pile? A feeding orgy, mostly. Your pile of leaves and kitchen matter won't yield humus until it's attacked and transformed by millions of decomposers. The "bugs" in your compost pile mean that it's working. A working compost heap is hot to the touch because a succession of microorganisms are busy munching, shredding, digesting and reducing the vegetable organic matter and each other to little bits. Bacteria first attack the waste, followed by fungi, then mites and fly larvae, springtails, beetles, earthworms and other soil organisms that gradually turn the material to humus.

What's Humus? A crumbly, dry material, dark brown or black in color, that remains when there's nothing left to decompose. Soil with humus added to it is richer in nutrients and looser in texture, enabling it to soak up water and take in more oxygen.

How do I Use Compost? Apply finished compost to the soil a month before spring planting or work half-finished compost into the soil in the fall. Mix the compost into the top 4 inches of soil. Add a total of ½ inch to 3 inches of compost each year. Compost can be added a couple of times a year.

Our Living Planet

Earth Day celebrations keep us focused on the state of our fragile home—the impacts we have on it, and how we can soften them.

by Michael F. Corcoran

Have you ever wondered if the things you do every day have an appreciable effect on the earth? Do you worry about what happens to the solid waste that you generate, the exhaust your car produces, the wastewater that leaves your home?

If you're like me, you probably feel an occasional twinge of guilt over the pollution caused by these trappings of modern life.

But deep down, you and I don't *really* think that we're causing significant damage to our planet.

Well, we're not alone. In fact, there now are around 5.2 billion of us humans on the planet. And together, we have caused greater changes on Planet Earth in the 20th century than occurred in the 10,000 centuries that preceded it. By burning fossil fuels (oil, coal and natural gas) we have drastically increased the carbon dioxide in the earth's atmosphere and very likely started a signficant warming of the earth's climate. We've allowed the loss of literally thousands of square miles of rain forests and presided over the extinction of uncounted numbers of species of plants and animals.

If we keep doing things the way we have been, we won't have much of a planet to leave to our children and grandchildren. It seems clear that we must learn to live in greater harmony with Mother Earth, and one of the best opportunities to learn how to do that is to plan to participate in Earth Day 1990 on April 22.

In fact, April is a time for a host of activities state- and nationwide focusing on our exquisite planet and its natural resources. Governor James Martin has proclaimed April "Celebration of the Outdoors Month" after the national Celebration of the Outdoors, which will be held during the week of April 22-29. Communities throughout the state are planning a variety of educational activities under this theme.

This year's Earth Day is a commemoration of the first one in 1970. Originally planned as a college "teach-in," Earth Day 1970 didn't attract as much attention as the massive civil rights marches and huge anti-war demonstrations. But, quietly, it achieved far-reaching results. Within just a few years came the creation of the U.S. Environmental Protection Agency and passage by the Congress of landmark legislation protecting the nation's air and waters.

The first Earth Day succeeded because it was a reflection of a fundamental change in the way Americans looked at their environment. The realization had dawned that our nation's resources were limited, that we could in fact "use them up." There was an amazing flowering of energy conservation initiatives through the 1970s, our air became just a bit clearer, and once-dead water bodies—such as Lake Erie—were revived.

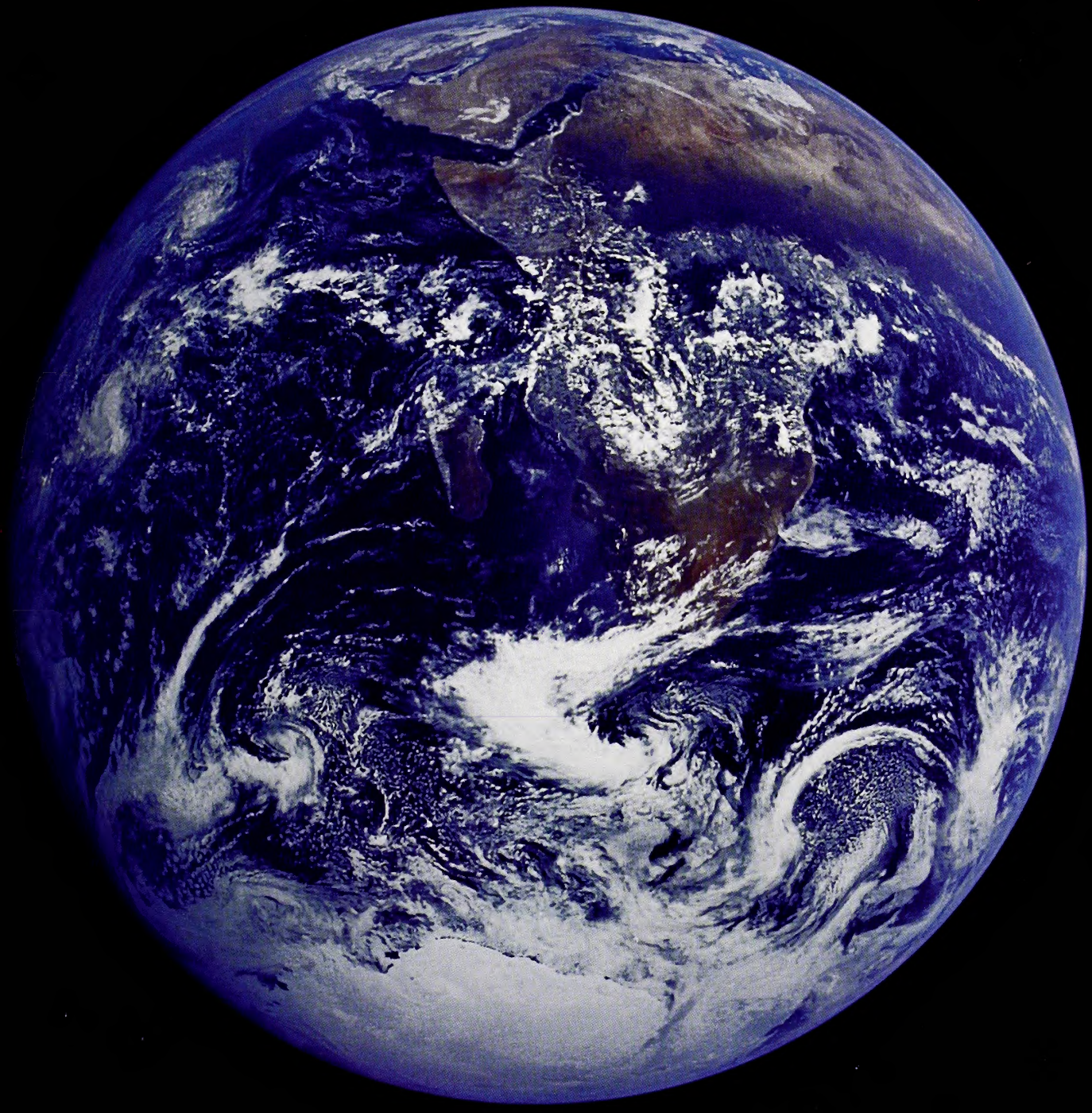
Something happened in the "me-decade" of the 1980s. People seemed to forget the good habits of the 1970s and fell back into wasteful habits of consumption. Now, we are beginning to discover the magnitude of the impact that our species has had on the biosphere. We've got to re-establish dedication to stewardship in the global community. Earth Day 1990 is our chance to take positive steps to protect the environment.

Our situation is far from hopeless. The news is not entirely grim. We have many success stories to build upon, including the resurgence of the bald eagle in North Carolina and stronger regulations to protect our water and air. Earth Day 1990 can succeed if we re-establish the idea that each of us can—and must—make a difference in the way we treat our planet. Here are just a few things that you can do!

- Plant trees — they absorb carbon dioxide from the atmosphere and turn it into wood.
- Use flow-reducing faucets and showerheads in your home — you can reduce water use by up to 50 percent and cut your power bill.
- Drive less and make your next car a fuel-efficient one — cars emit 20 pounds of carbon dioxide for every gallon of gas they burn.
- Use cloth or string grocery bags when you shop — that way you won't have to answer the question, "Paper or plastic?"
- Recycle as much of your aluminum, glass and plastic as you can. If your local government doesn't have a recycling program, ask it to start one.

Once you start with just a few simple changes, such as the ones above, you'll be doing something important to protect our planet. See you on Earth Day!

Michael F. Corcoran is Executive Vice President of the N.C. Wildlife Federation.



***Looking like a** jewel on black velvet, planet Earth was photographed by Apollo 17 crewmen during their journey toward the moon in 1972. The view shows the Mediterranean Sea south to the Antarctic polar ice cap.*

On Track for Trout

The trout will be wilder and the fishing better as the Wildlife Commission's new trout-management plan begins to take effect.

by Vic Venters

The drive from Raleigh to the Davidson River was a long one, especially at 2 a.m. on a Saturday after a long week behind the computer. By the time we reached Asheville, our eyelids were starting to feel like sandbags and Steve Wilson was grumbling about the crankcase coffee dribbling down my chin. Strangely, we couldn't have been in better moods, the promise of trout fishing and solitude as sweet a gift as nature offers.

Oops. Did I say solitude? On the Davidson?

Dawn's light revealed dozens of shiny new Japanese four-by-fours and European station wagons perched by the river, each disgorging a couple of fishermen, most of them clean shaven, all similarly clad in neoprene waders and clutching new graphite rods and pricey English fly reels.

"Look at those yuppies!" I sneered, warming to the idea of an early morning tirade.

"Vic," Steve told me with his calmest schoolteacher voice, "we are yuppies." Then he handed me my new graphite fly rod and pricey English reel.

It's no secret that North Carolina's mountain streams are growing more crowded as trout fishing becomes increasingly popular in the state. Today, about 110,000 trout anglers share 2,100 miles of public trout waters. This is a substantial jump from 1974, when there were only about 65,000 trout anglers. Obviously, the days when the sport was limited to mountain locals and a select few fly fishers are gone forever. Already anglers jostle for space on accessible rivers like the Davidson and it's not hard to imagine a time when finding uncrowded water may be as difficult as landing a 20-inch brown.

Unfortunately, anglers aren't the only people finding trout country attractive these days, and increasing development brings its bastard stepchild — sediment. As North Carolina's mountains become a popular resort attraction, the list of trout streams ruined by sedimentation and habitat destruction grows longer each year. In short, more anglers, less water.

With trout streams in danger of being encircled by these two converging forces, the N.C. Wildlife Resources Commission is preparing to launch its new trout-management plan this spring, a three-pronged counterattack that should go a long way toward preserving habitat and coping with trout fishing's increasing popularity. The plan's three primary goals will be to improve the quality, quantity and diversity of trout fishing in the state. To do this, the Wildlife Commission will focus on making improvements in four major areas: wild trout management, stocked trout management, habitat protection and research.

To place this new management strategy in perspective, remember that North Carolina's streams are located at the southernmost range of cold-water trout habitat. This restricts trout populations to the cool streams and rivers of our mountain region. As geography would have it, the granitic, freestone geology of the region limits stream fertility, resulting in wild trout populations dominated by fish less than 3 years old and less than 10 inches in length, whether they be browns, rainbows or brook trout. Also, steep hills and high stream gradients make our trout waters extremely susceptible to habitat disturbance. These factors combine to make careful management a necessity.

Wild Trout Management

Perhaps the most fundamental change planned will come in the area of wild trout management. All trout waters that are not stocked will be designated as wild trout waters (now called native waters). In effect, this reverses the current practice of naming all trout waters as general waters unless they are specifically designated native (wild) trout waters.

Of the 2,100 miles of public trout water, about 1,700 miles are general water (open to bait fishing and subject to stocking) while the other 400 miles are managed under the native regulations (artificial lures, smaller creel limits) that protect wild, self-reproducing trout populations. However, of this general water, only about 1,000 miles of streams are stocked, leaving 700 miles of nonstocked general water. Under the new plan, much of this nonstocked general water

***With action** like this, it's no wonder that trout fishing is booming in popularity. In the face of growing fishing pressure and development, the Wildlife Resources Commission's new trout-management plan seeks to improve the quality, quantity and diversity of trout fishing in the state.*

CURTIS WOOTEN

***Trout eggs** need clean, cold water and gravel free of silt to successfully hatch. The Wildlife Resources Commission is intensifying its efforts to protect trout streams from increasing development in the mountain region.*

will be designated wild trout water.

"Our intent is to manage wild trout by capitalizing on their ability to sustain themselves by natural reproductive capabilities," said Jim Borawa, the Wildlife Commission's mountain region fisheries research coordinator and one of the architects of the new management plan. "Many of these waters are fully capable of supporting good wild trout populations and there's no reason they shouldn't." In addition to improving the fishing, it makes good economic sense. The new classification will also clearly identify the 1,000 miles of streams that will be stocked, thus eliminating much of the confusion of the current general water category. Anglers can look for this reclassification to be proposed in the spring of 1991.

Brook trout, or "speckles," as they are locally known, are the only *salmonid* native to North Carolina, and unfortunately, they are in deep trouble. Easier to catch than brown trout or rainbows, they are also more susceptible to habitat alteration and in-stream competition from the bigger, more aggressive trout species. Browns came from Europe, while rainbows came from the West Coast. Each year, Wildlife Commission biologists find brookies retreating farther and farther up tiny headwater streams, while browns and rainbows continue to expand into waters formerly occupied only by brookies.

As part of the plan's emphasis on protecting this North Carolina native, Wildlife Commission biologists and volunteer anglers will begin identifying, classifying and inventorying brook trout streams this summer. After the inventory is complete, biologists and volunteer anglers will be looking hard at various management options. In some cases, protective regulations may be needed; in others fish barriers may be built to prevent upstream migration and non-native species removed.

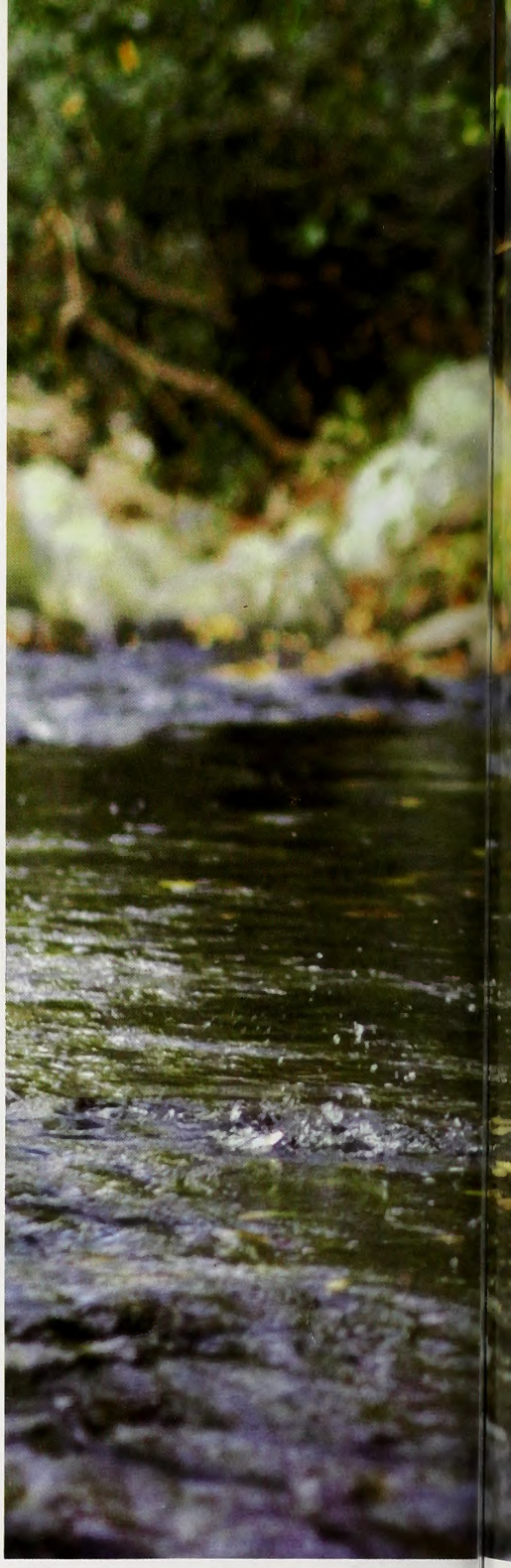
One of the first places fishermen will see increased protection for brook trout will be in Panthertown Valley, a 6,700-acre tract just acquired by the U.S. Forest Service from the North Carolina Nature Conservancy. Catch-and-release regulations will be in effect as soon as those waters are opened to the public. "There is some evidence to show that our brook trout populations are so sensitive to harvest that the only way to go is to allow no harvest," Borawa explained. "Catch-and-release will protect the brook trout while still allowing anglers to enjoy them."

Along with trout fishing's increasing popularity, there's no question that the nature of the game is changing as anglers become more interested in how it's done rather than how many fish they can carry home. "We are already seeing a shift to the use of more artificial lures and flies," Borawa explained. "We want to give as many people as possible a variety of fishing experiences." Although specific streams have yet to be chosen, anglers who ply wild trout waters in the 1990s can look forward to the possibility of more catch-and-release regulations and streams managed for trophy brown trout. The Commission is also seeking to open more private lands supporting wild trout.

Stocked Trout Management

One of the biggest trout I've caught in the East came from general stocked waters and despite its being a planted fish, I couldn't have been prouder. It took a Tellico nymph in a riffle run on an East Tennessee river, and it was big enough to strip all the fly line off my reel and steal my breath away as well. After 18 minutes it was mine, at least until I slipped it back into the water, just as a biologist had once slipped it into the river as a fingerling half a decade ago.

Currently, the Wildlife Commission's three mountain trout hatcheries are producing about 600,000 fish per year, each fish averaging a little over 9 inches in length. With operations now stretched to capacity, the chances of more fish being produced to stock more water seem unlikely. However, that doesn't mean there aren't some exciting new management options being considered.



Although our streams aren't as productive as tailwater rivers in other states, North Carolina has quite a few large streams that could support good numbers of trout but that have limited spawning habitat. Although the streams could be stocked with catchable-size trout, a large percentage of hatchery production would have to be targeted to fill those streams. "Put-grow-

KEN TAYLOR

This angler *prepares to net a trout caught in a stocked stream. In addition to improvements made in wild trout management, anglers may see popular and effective new management options in effect on stocked waters in the coming years.*

and-take" — where fingerlings are stocked annually and allowed to grow before being caught — offers an excellent alternative.

Delayed harvest is another option. "With this, we can mimic a wild trout population for a time," said Borawa. "A stocked stream could have big fish and smaller fish. Fishing would be permitted but harvest would be delayed and anglers could enjoy a high catch rate for a long period of time. When the water temperature in some of those delayed harvest streams increases in the summer, then harvest would be allowed before warm water adversely affects them." Regulations such as this are used extensively in states like Pennsylvania and are popular with anglers.

The Commission plans to continue its high-frequency stocking of selected streams as well as its regular moderate-frequency stocking program. One improvement that is already being made is spreading stocked fish all along a stream rather than just dumping them in a few large pools. Increased emphasis will also be placed on accurately assessing fishing pressure on streams and modifying stocking rates to meet the needs of the fishing public.

In the past, the state's rugged mountain terrain has hampered anglers with disabilities. The Wildlife Commission, along

***To produce** large fish like this wild 16-inch brown, North Carolina's waters need careful management. The granitic, freestone geology of the mountain region and its nutrient-poor waters typically yield populations of trout less than 3 years old and less than 10 inches long.*

with the help of Trout Unlimited and the U.S. Forest Service, has already made considerable progress in rectifying this problem. A barrier-free fishing area on Bent Creek at the new N.C. Arboretum near Asheville will provide decks and ramps for the handicapped. Barrier-free projects are also under way at Balsam Lake, Lake Powhatan, and on the Catawba River below Lake James.

Habitat Protection

The July sky hung low and dark, and the rain came in barrels, not buckets, as Tom Earnhardt, a national Trout Unlimited director, and I stood beside a highway improvement project near a golf course at the Linville River. We had hoped to catch some of the red-sided rainbows; instead, we watched a river drown under runoff torrents bloody with mud. Downstream, I thought, it was probably going to be another tough year for the Linville.

There are, unfortunately, many more streams like the Linville and Mitchell rivers where upstream development has severely damaged the fishery. Not only can habitat alteration raise water temperatures and increase pollution and nutrient loading, but resulting sediment smothers spawning areas

JIM DEAN

and aquatic organisms that trout depend on for food. And yes, the problem is getting worse as development booms in the mountains.

Essentially, the Wildlife Commission will be fighting to protect trout habitat in several ways. First, the Commission is cooperating with the Water Quality Section of the state's Division of Environmental Management to develop consistent water-quality classifications to better protect fragile trout habitat. "We will be pushing hard for High Quality Waters and Outstanding Resource Waters designations where streams meet the requirements," said Fred Harris, chief of the Wildlife Commission's Division of Inland Fisheries.

JIM DEAN

***More and more** women are finding the lure of trout fishing irresistible as Susan Dean will testify. Since the mid-'70s, the number of anglers pursuing trout has increased from about 65,000 to 110,000 and shows no sign of stopping.*

The exclusion of trout streams from the U.S. Army Corps of Engineers' nationwide permits should tighten up some previously large loopholes that allowed some harmful development. Previously, if a project was less than one acre in size, virtually anyone could get a federal permit that allowed filling in of wetlands or stream discharge. The problem was that, even though a project was small, it could still do a lot of damage. Now, small projects that might affect Designated Public Mountain Trout Waters are no longer afforded a blank check for development and must be reviewed by Wildlife Commission biologists, who can recommend denials, or condition modifications, to the Corps to lessen the impact of a development.

There's also room for physical stream improvement. Through a reciprocal agreement called the 1986 Memorandum of Understanding, the Wildlife Commission, Trout Unlimited and the U.S. Forest Service are working cooperatively to improve our state's trout fishing through stream renovations and habitat improvements.

Research

Anyone who's ever been lucky enough to fish on private water knows that supplemental feeding and limited harvest can produce some awfully big fish. In a joint research project between Trout Unlimited and the U.S. Forest Service, Commission biologists will study fish populations in four native trout streams where experimental feeders have been installed. The experiment will determine if the size of wild trout can be increased even if some harvest is allowed. "If it looks like it works we'll do it on more streams," Harris said. "We'd like to see if we can increase the size of these fish at a reasonable cost and effort."

Other planned research projects aren't perhaps so glamorous as artificial feeders, but they are equally important. Detailed biological surveys of both stocked and wild trout waters are planned to evaluate how management practices and natural variations are affecting populations. Angler surveys will be critical, and the Commission plans to have one ready in the next two years. Angler sentiment was used in setting the tone of the new management plan, with 68 percent of the respondents indicating that they supported wild trout management strategies.

The new trout plan offers something for all anglers, whether you choose a fly rod or canned corn. There's likely to be some arguing between factions before everyone is happy, but then, arguments and anglers go hand in hand. In the end, there's more at stake than the regulation changes being discussed here. If development trends continue unabated, the battle to protect habitat will become a war and trout anglers who care will be needed to win it. ⊠

The Rush To Recycle

Overflowing landfills lend urgency to North Carolina's recycling efforts. It's a cause that's catching on, and everyone can participate and benefit.

by Lawrence S. Earley
photographed by Melissa McGaw

Fenna Corry could be excused if she was feeling a little giddy. "We collected almost 5,000 pounds of glass — in one week!" she said. Three years ago, as an administrator of the New Garden Friends School in Greensboro, she had begun a modest recycling program to provide the schoolchildren an outlet for their community service work. The city was only minimally involved with recycling, so Corry packed a tractor trailer in the school parking lot with barrels for glass, aluminum and plastic discards. The community jumped at the chance to recycle. "Now if I work on a Saturday at school," she says, "cars are in and out all day long. It's heartening to see how many people are involved in this."

Fenna Corry isn't the only one to discover the popularity of recycling in North Carolina. Fledgling recycling programs in a host of towns, big and small, are meeting enthusiastic — sometimes overwhelming — responses.

"Recycling is an environmental issue, but it's not scary like toxic waste or groundwater pollution," explained Sandi Maurer, president of the N.C. Recycling Association, at the group's annual meeting in January. "Everyone can play a part. It's very positive. The 1990s will be an exciting decade for recycling, and we can count on a public groundswell to support us."

This groundswell was given considerable impetus during the last year with the passage of Senate Bill 111 in the General Assembly. The bill seeks by January 1, 1993, to reduce by 25 percent the waste going into landfills and recommends reducing waste at the source, recycling it and reusing it as the best ways to accomplish this end. It requires local governments to develop recycling plans. In addition, the state created new positions in

***With each** Tar Heel throwing away anywhere from 3 to 6 pounds of garbage per day, landfills throughout the state are rapidly reaching capacity. Nearly two thirds will be filled by 1995 and the search goes on for new landfill space.*

LAWRENCE S. EARLEY

Recycling isn't the only solution to aging landfills, but it's one of the easiest, least costly and most energy efficient ones.

the Solid Waste Management Section, including its first full-time recycling coordinator. And an interagency task force, created by Governor James Martin, was organized to devise ways to implement recycling programs in state government and procure recycled products.

Though Senate Bill 111 has some glaring defects — most notably, no money to help local governments meet the state objectives — it represents a major commitment toward recycling. For the first time, the state is taking its leadership responsibilities seriously in this area, and that's good news for environmentalists worried about our ingrained throw-away habits. According to the U.S. Environmental Protection Agency, each American generated 3.58 pounds of garbage a day in 1986, compared to 2.65 pounds in 1960. The figures may be even higher in North Carolina. Analyses of the "waste stream" produced by six counties show that each day Tar Heels are throwing away about 6 pounds of trash apiece. And where does it all go? Straight to landfills, mostly — 80 percent of it, according to EPA figures, while 10 percent goes to incinerators and only 10 percent of it is recycled (compared to 50-percent recycling in Japan and 30-percent in Western Europe).

At this rate, in five years our waste binge will fill to capacity one third of the nation's landfills and nearly *two thirds* of the state's. New landfills desperately need to be constructed, but rampant NIMBYism (Not In My Back Yard) has made landfill siting a political quagmire. Besides, landfills are expensive to build — they can cost from $150,000 to $200,000 an acre, especially with new and mandatory EPA environmental safeguards. Incinerators, sometimes considered an alternative to landfills, have their own hazards, releasing a host of air- and waterborne pollutants that are dangerous to public health and the environment.

Recycling isn't the only solution to aging landfills, but it's one of the easiest, least costly and most energy-efficient ones. And if it has been getting some extra attention in the past year or two, recycling is hardly new to Americans. Few of us have missed sweating through at least one Saturday afternoon on a church- or community-sponsored newspaper drive. And after 1970's Earth Day, several waves of recycling enthusiasm have flowed and ebbed across the land.

Students and teachers at Greensboro's New Garden Friends School run a successful recycling program for newspaper, glass and aluminum. Volunteer efforts like this have been popular especially in rural areas where hardpressed local governments have few resources to give to recycling. A new state law, however, requires local governments to develop recycling programs.

Yet today's recycling fervor is different in at least two respects. For the first time in the past 20 years, governments — state and federal — are serious about checking the throw-away mentality of Americans. EPA administrators have targeted a 25-percent nationwide waste reduction goal by 1991. (Seattle, one of the most progressive recycling communities in the nation, is aiming at a 60-percent reduction by 1998.) Another difference is that today's recyclers are looking at more than the traditional big three — newspapers, aluminum and glass. As recycling grows in popularity, entrepreneurs are cashing in on new opportunities.

Plastics recycling is one of them. Plastic is one of the most ubiquitous materials in our advanced civilization but one that has resisted recycling efforts until the last 10 years or so. Though they make up only 6.5 percent of municipal waste by weight, plastics may take up anywhere from 25 to 32 percent of a landfill's volume. "It's not tonnage that fills landfills," says Steve Shannon, solid waste coordinator of Alachua County, Florida, and the keynote speaker at the N.C. Recycling Association meeting. "Most of our waste is air surrounded by plastic or something else."

"The technology (for recycling plastic) has been around for several years," says Barry Appelget, founder of Mountain Polymers of Greensboro, one of the most active plastics recyclers in North Carolina. He has plants in Greensboro and Raleigh, and two more are in the works. Plastics recyclers now can accept several kinds of plastic: the plastic used for soft-drink bottles and other containers (polyethylene terephthalate or PETE, formerly PET); high-density polyethylene (HDPE), used for milk cartons; and polystyrene foam that makes coffee cups, egg cartons and clamshell hamburger containers.

The key to plastics recycling — and any other kind as well — lies not only in developing recycling technology but also in stimulating markets that will buy recyclable items, and that's where a lot of recyclers have failed. Recycling is, after all, a cycle — it's only complete when the raw materials are returned and purchased as commercial products. "It's easy (for plastics recyclers) to collect the materials, and the processing isn't real difficult either. But what do you do with it after you get it?" asks Appelget. Senate Bill 111 says that the state should help industries like Appelget's by developing markets for recycled goods. Mountain Polymers already sells its processed plastics to markets overseas and in about 30 states in this country.

Clearly, the business opportunities are opening for recyclers, stimulated partly at least by Senate Bill 111. By 1993, according to one provision of the bill, the state will ban the use of several packaging materials, including plastic bags and containers and polystyrene foam products, unless they are recyclable and *are being recycled*. Moves like that have brought new customers to Appelget's door.

Opportunities have also widened for the recycling of other untraditional materials — office paper, tin cans, cardboard, automobile tires, oil and batteries, yard trash and scrap metal. The state law says that by July 1990 the state will regulate scrap tire collection sites. Each county will be responsible for providing scrap tire disposal sites for tires in its jurisdiction. Between January 1991 and January 1993, local governments are required to eliminate batteries, used oil, yard trash and refrigerators and other appliances from landfills.

***New opportunities** are opening for recyclers. Plastics were once considered hard to recycle, but Greensboro businessman Barry Appelget (top) is making money by recycling a variety of plastic goods. In Raleigh, where office paper constitutes more than half of landfill drop-offs, Grime Control picks up office paper from state offices and sells it to a paper recycler. Gloria Taylor (above, right), part owner of Grime Control, meets with Mary Beth Powell, the state recycling coordinator.*

Other products are being recycled as technologies develop. During a 6-week period in February and March of this year, Raleigh's Keep America Beautiful volunteers collected telephone books for recycling. "Just in the city of Raleigh, there are probably 821 tons of phone books available," says Lois Nixon, director of the group. "The problem is, we don't have the transportation to haul them all." Printers' solvents, used by printers to clean their presses, photographic film (the plastic part is recyclable) and methane gas from old landfills are also being recovered.

Of course recycling needs differ from municipality to municipality, county to county. In Wake County, home of state government, 59 percent of the trash going into the landfill is paper products, according to Lois Nixon. "We really need to get a handle on office paper," she says. Alamance County's waste-stream analysis revealed that 31 percent of its garbage was cardboard, and so it banned cardboard dumping in its landfill.

While the needs differ from place to place, local government's dedication to recycling varies predictably. According to a recent survey by the N.C. Center for Public Policy Research, only 34 of North Carolina's 100 counties provide their residents with established recycling programs; 28 provide minimal service; and 38 provide *none*. Only 18 counties have full-time recycling coordinators. This difference usually reflects the financial abilities of governments, with poorer, rural counties doing less than richer, urban counties.

Urban Mecklenburg County, for instance, is recognized as having one of the

Recycling For Keeps

Waste Not

Want to cut down on your household waste? First, call the city or county government to find out what materials can be recycled in your community and the places and times of collection. Then set up several containers (plastic milk crates are great) for your glass bottles, plastics, white office paper, etc.

Take your recyclables to the designated drop off points. Vegetable peels, coffee grounds and other food scraps can be added to a backyard compost pile. How much trash have you saved from the landfill?

Reuse it!

- Buy cloth diapers, napkins, towels and rags rather than disposable products. Buy sponges and rechargeable batteries—anything that can be used again and again.
- Bring grocery bags back to the store for your next purchases.
- Use the blank back sides of paper to take notes.
- Mend clothes and repair broken appliances.
- Reuse your ziploc and other plastic food-storage bags.

Reduce Waste at the Office

- Use a washable rather than a disposable coffee cup.
- Buy recycled paper products. The greater the demand for recycled paper, the cheaper it will be. Some copy centers and print shops now carry recycled paper; ask for it. Support businesses that use or sell recycled products.
- Copy on both sides of the page. Most copy machines now have the ability to copy on both sides.
- Recycle computer and other office paper. Find a market for your paper, introduce the program to your employees, and help co-workers separate recyclable papers at the desk.

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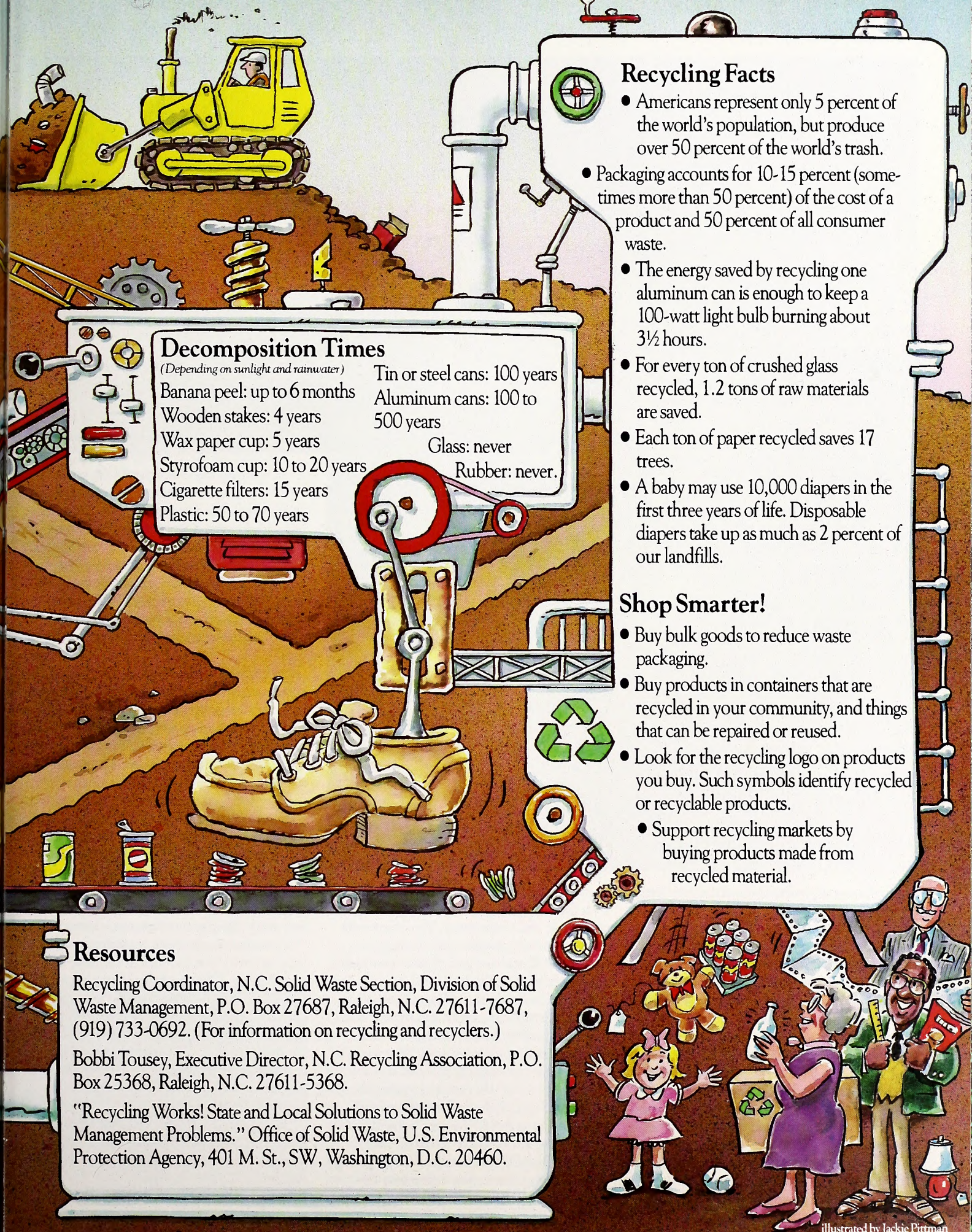


Recycling Facts

- Americans represent only 5 percent of the world's population, but produce over 50 percent of the world's trash.
- Packaging accounts for 10-15 percent (sometimes more than 50 percent) of the cost of a product and 50 percent of all consumer waste.
- The energy saved by recycling one aluminum can is enough to keep a 100-watt light bulb burning about 3½ hours.
- For every ton of crushed glass recycled, 1.2 tons of raw materials are saved.
- Each ton of paper recycled saves 17 trees.
- A baby may use 10,000 diapers in the first three years of life. Disposable diapers take up as much as 2 percent of our landfills.

Decomposition Times

(Depending on sunlight and rainwater)

Banana peel: up to 6 months
Wooden stakes: 4 years
Wax paper cup: 5 years
Styrofoam cup: 10 to 20 years
Cigarette filters: 15 years
Plastic: 50 to 70 years
Tin or steel cans: 100 years
Aluminum cans: 100 to 500 years
Glass: never
Rubber: never.

Shop Smarter!

- Buy bulk goods to reduce waste packaging.
- Buy products in containers that are recycled in your community, and things that can be repaired or reused.
- Look for the recycling logo on products you buy. Such symbols identify recycled or recyclable products.
- Support recycling markets by buying products made from recycled material.

Resources

Recycling Coordinator, N.C. Solid Waste Section, Division of Solid Waste Management, P.O. Box 27687, Raleigh, N.C. 27611-7687, (919) 733-0692. (For information on recycling and recyclers.)

Bobbi Tousey, Executive Director, N.C. Recycling Association, P.O. Box 25368, Raleigh, N.C. 27611-5368.

"Recycling Works! State and Local Solutions to Solid Waste Management Problems." Office of Solid Waste, U.S. Environmental Protection Agency, 401 M. St., SW, Washington, D.C. 20460.

illustrated by Jackie Pittman
produced by the N.C. Wildlife Resources Commission and the Solid Waste Section, Dept. of Environment, Health and Natural Resources

Although recycling is the main effort in reducing our landfill problems, a lot of waste management can be done right in the home. Reduce waste at the source.

***Reducing, recycling** (left) and reusing (above) can add years to our landfills. The average baby uses anywhere from 4,000 to 10,000 diapers before toilet training, and 16 to 18 billion disposable diapers (made from plastic and wood pulp) end up in landfills every year. Cotton diapers can be used over and over and are an environmental alternative to disposable diapers.*

best integrated waste-management programs in the country. It places a lot of emphasis on recycling. County residents passed $5 million in bonds in the 1980s to fund the recycling program. "The bonds were passed for three reasons," says Fred Remington, the county recycling coordinator. "First our landfills were reaching capacity. Second, we saw the need to help save natural resources through a reduction in energy use that's associated with recycling. And third, we believe that recycling may be used as a bridge to understand the consequences of our actions on the natural world."

The county's strong recycling effort features a mix of passive drop-off centers and more aggressive techniques. There are two staffed and eight unstaffed drop-off centers; a mulch center where clean yard waste is shredded and sold; curbside collection of glass, aluminum, newspapers, bimetals, steel cans and plastic containers; cardboard and metal recovery at the landfill; white office paper collection from county and city offices; and an education program featuring a speakers' bureau and an indoor amphitheater at the recycling facility with state-of-the-art audiovisual equipment.

Recycling on this scale can only be dreamed of by poor rural counties, and environmentally minded residents may feel tempted to throw up their hands. What can they do?

Reduce and reuse. Although recycling is the main effort in reducing our landfill problems, a lot of waste management can be done right in the home. Reduce waste at the source is the first rule of recyclers. "Don't even create the stuff in the first place," urges Gary Kenton, president of Citizens for Waste Reduction and Recycling in Greensboro. Reduce the amount you throw away and reuse what you can. Individual shopping and throw-away habits can play a big role. Bring your own bags to the supermarket and use them over and over. Buy products that can be recycled. Use cloth diapers, napkins, towels and rags rather than paper equivalents. Buy rechargeable batteries. Purchase your foods in bulk to reduce the amount of packaging you throw away. You can reduce the amount of trash that gets dumped in your landfill, and you can do it by yourself. (See "Recycle for Keeps.")

Start your own recycling organization. Fenna Corry did it and many other schools, church groups, scouts and civic organizations are doing it, too. "A couple of years ago there was nothing in Madison County for those who wanted to recycle, so we formed the Madison Environmental Alliance," says Bobbi Tousey, a county resident and the new executive director of the N.C. Recycling Association. The group worked with community volunteers in building drop-off recycling bins ("Most rural counties don't have curbside pickups," she says) and worked with the county in setting up drop-off centers. Different community groups serviced each location and kept the proceeds from what they collected.

The group set up "cash for trash" days. "You can generally find a recycler from the city who can bring trucks and scales," Tousey says. "We started in October 1988 and took in about 28,000 to 30,000 pounds of glass, aluminum, newspaper and cardboard in one day." Today the group has buy-back days on two Saturdays a month.

Though volunteerism is an alternative to a local government vacuum, it can take its toll, says Tousey. "You get burned out because there's just such a huge amount of material. Our feeling is the counties must get involved because it's too big for volunteers to do." In the meantime, the Alliance has aggressively pursued grants to hire a recycling coordinator who will relieve some of the pressure on the volunteers.

What about counties that can't float multimillion-dollar bond issues? The state law is encouraging even the poorer counties and municipalities to reduce waste by 25 percent by 1993. What can they do?

Establish or raise "tipping fees." More than half of the state's landfills don't charge a fee for trash dumping. A tipping fee can be an incentive to industries and businesses to recycle and the income can help fund a recycling program. Raleigh just raised its tipping fee from $5.90 a ton to $10 a ton and the difference will support an enterprise fund that will finance the county recycling and solid waste programs. Buncombe County has a $23-a-ton tipping fee and now charges $46 a ton for industrial commercial cardboard.

Yet, will such aggressive landfill policies backfire, stimulating midnight dumping and other illegal practices rather than recycling? "It's a real concern," says Mary Beth Powell, the new state recycling coordinator. "One thing that's been suggested is to raise the fees gradually. If you don't charge anything and all of a sudden you slap on a $15 fee per ton, people will get upset."

Powell acknowledges that recycling is expensive, yet she points out that there are hidden costs in present waste-management practices. "When you think about all that's involved in siting a landfill — hiring consultants, designing the landfill, purchasing the land, paying out hundreds of thousands of dollars — and then you have an irate public say, 'We don't want it here!' and all of that goes down the tubes.... Every year we can make our landfill last a little longer we're saving tremendous costs."

Think regionally. Landfill construction and recycling programs can be expensive, but their expense can be reduced when adjoining governments work together. "A whole lot is happening through the regional councils of governments," says Powell. "This is especially true in rural counties that can't afford to bring on a recycling coordinator full time. Counties can go ahead and design regional recycling programs." One example is Region R of the Council of Governments (comprising 10 eastern counties), where planning is underway to build one or two regional landfills. "There are economic reasons for doing it — it'll save us all a lot of money — and environmentally it's better," says Dare County Manager Jerry Wheeler.

Senate Bill 111 has made it clear that recycling is no longer just an option. Local governments must begin immediately to reduce waste by recycling, and a key to their success will be public education. "Education is going to be extremely important, not only with individual citizens but with local officials, with the county and city staffs and particularly with businesses and industries," says Powell.

"Teachers feel that by starting with schoolchildren, we'll have a sort of 'trickle-up' effect," adds Fenna Corry about the need for public education. "Children will see their parents getting ready to throw something in the trash, and they'll wag their fingers at them and say, 'Don't you throw that glass jar away.'"

It may take a while for recycling to become as habitual as our present throw-away habits, but if we're drowning in our own waste, as indeed we are, recycling may well be the easiest way to renew the stewardship we owe to our once and future home, Planet Earth. ⊠

***In many communities** like Durham, curbside pickups of recyclables are complementing the more traditional drop-off bins. Whatever the methods, recycling programs in cities and towns across the state are meeting with overwhelming success.*

FREE POSTER Reprints of "Recycle For Keeps," the poster located on pages 16-17, can be ordered free for educational uses. To order your poster, write: Recycling Poster, Division of Conservation Education, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188. Or write: Recycling Coordinator, Dept. of Environment, Health and Natural Resources, Solid Waste Section, P.O. Box 27687, Raleigh 27611-7687.

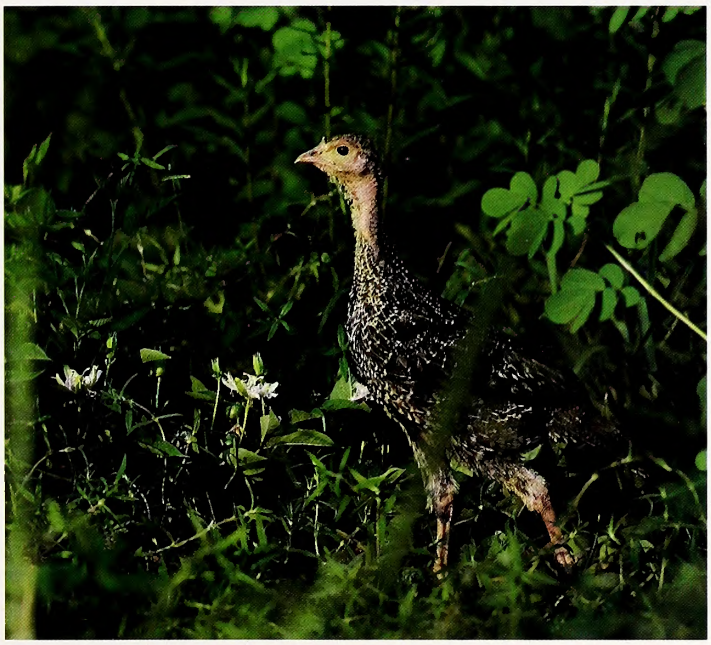
Turkey Time

For the world's wariest bird, the passage from egg to adult is fraught with peril, but this stately species has the instinct to survive given half a chance.

written by Vic Venters
photographed by Lloyd Hill

The turkeys had known it was coming for weeks. Something in the way the sun lingered on the ridgetops told them so. Spring was here. A time for courtship. A time for battle. Wings beat, spurs pushed and gouged. Fatal wounds were rare; the victors' gobbles were not.

Snails, she wanted. Rich in minerals, they provide the extra calcium the hen needed for egg production. Clutches were complete at 12 or 14 eggs, the hen laying over a two- or three-week period. After incubation began, the hen sat tight, straying only for a brief daily feeding expedition. Four weeks later, the poults emerged.



The poults matured quickly. They needed to. Predators and foul weather provided few of them a second chance. In a week or 10 days, they could fly up to 50 feet and were soon able to roost in trees. They molted twice in the summer and by six weeks their coat of juvenile feathers was complete. In six months, jennys (females) may weigh 7 pounds, jakes (males) as much as 12 pounds. Ready for winter. ⊠

Beetle Mania

There are far more good beetles than bad, and some are truly nature's living jewels.

written and photographed by Harry Ellis

The handsome *coloring of this fiery caterpillar hunter belies its predatory nature.* Calosoma scrutator *is one of the most beneficial insects to man, eliminating large numbers of crop-destroying caterpillars. Of the 27,000 species of beetles found in the United States, only a handful are harmful.*

Rugged explorers have climbed the earth's highest mountains and searched the darkest jungles in quest of new knowledge, leaving unnoticed and unexplored many smaller, nearby realms. Here, close to home, the less hardy among us can find ample fascination in the exploration of nature's marvels. For me, one avenue to such adventure has been to take a close look at the world of beetles. The *Coleoptera*, largest of the insect orders, represents more than a third of all known species of insects, and the amateur naturalist can find plenty of interesting beetles to study in a backyard or nearby field or woods.

Beetles arose some 230 million years ago and quickly occupied every habitable portion of the earth. Found on every continent except Antarctica, about 300,000 species have been identified worldwide, more than 27,000 in the United States. They range from the size of a pinhead to the goliath beetle of the Congo rain forests, a giant that reaches a length of 5 inches and the weight of a full-grown rat. To the average woodland stroller, beetles are simply "bugs," an inaccurate designation in any true taxonomic sense. True bugs belong to an entirely different order of insects.

Though fewer than one percent of all beetles are harmful to man and his crops, he has waged a relentless war over many years against these few destructive pests. They include the Japanese beetle, the Colorado potato beetle, the Mexican bean beetle and the notorious bollweevil, the scourge of southern cottonfields. In spite of these "black sheep of the family," the great majority of beetles are in some way useful as part of an enormously complex ecological web. "When we try to pick out anything by itself," wrote John Muir in his journal, "we find it hitched to everything else in the universe."

While most of the world's brightest-colored beetles are found in the tropics, a number of colorful forms are common in our own fields and woods. Some of them rank high on the list of nature's most beautiful and richly textured creatures. Several species are iridescent, flashing a different hue every time the beetle moves or the angle of light changes. Their shimmering rainbow colors are produced when light strikes the hundreds of tiny ridges and grooves on the body surface. These miniature prisms separate sunlight into its component colors.

Outstanding among these beauties is the green, six-spotted tiger beetle (*Cincindela sexguttata*), clothed in glittering metallic green, with iridescent shades of purple and violet. It preys on other insects and, unlike many of its kind, does most of its hunting in the blazing sun, rapidly flying about or running swiftly over the ground seeking prey to devour. By its blood-thirsty habits in both the larval and adult stages, it lives up to its name of "tiger beetle." Another beetle, the dogbane leaf beetle (*Chrysochus auratusis*), is a living jewel among insects, green with a golden iridescence, shading into ruby red, each change of light creating a dazzling play of color. When several are seen congregating on dogbane leaves, the plant appears studded with glittering gems. Yet another handsomely colored insect is the fiery caterpillar hunter (*Calosoma scrutator*), one of the Carabid ground beetles. This large, rather rare beetle is marked by a green

***Shimmering like a** jewel, this dogbane leaf beetle* (Chrysochus auratusis) *finds a daisy a handy resting place. Beetles are found on every continent except Antarctica with about 300,000 species identified worldwide.*

and coppery iridescence, with the elytra — the hard, chitinous wing covers — edged in scarlet. One of our most beneficial insects, it destroys large numbers of destructive caterpillars, sometimes climbing trees in search of them. Other attractively colored beetles are the elderberry longhorns, the red and black milkweed beetle, the fungus beetle, and the red flat bark beetle.

The bizarre-looking eyed elater, one of the click beetles, is salt-and-pepper colored, with two large round eyespots on the prothorax. At a glance it resembles the head of a snake, and this appearance may frighten birds and other predators — a definite survival advantage. Grotesque-looking also is the stag beetle. There is a greatly exaggerated development of the mandibles in the males, which they probably use as stags use their antlers to battle over females. The horned Passalus beetles or "bessbugs" live in galleries they cut in rotting logs. Each adult has one short horn on the head, pointing forward, and when viewed close up with a hand lens, the beetle has the appearance of some nightmare monster conceived in the mind of a restless sleeper.

One of nature's greatest gifts to farmers and gardeners is the ladybird beetle. There are many species, most of them brightly colored with polka-dot patterns. Almost all of them, in both adult and larval stages, consume huge populations of harmful aphids. In early autumn, convergent ladybird beetles (*Hippodamia convergens*), one of our most common species, assemble in great masses or swarms and fly long distances to hibernate in rock crevices, rotting stumps and other suitable sites. With the arrival of spring, they return to our fields and gardens at about the time the aphid season is beginning.

Fireflies, called "lightning bugs" by children, are neither flies nor bugs, but soft-bodied beetles of the family *Lampyridae*. Their rhythmic light patterns appear to be a kind of Morse code communication between the sexes, the males winking their lights in the air and the wingless females answering them from the grass clumps. The cold, greenish fire in the glowing abdominal segments is produced by the oxidation of a

substance present in the luminescent organs called luciferin. But although we can name the chemicals that produce it, the process itself is only dimly understood. It seems such a simple thing, yet so mysterious. Adult fireflies have a brief season of brilliance and flight and then, one by one, the little lights vanish. Yet they will have already left active larvae in soil or rotting wood as their legacy to another summer, when once again a new generation will light their eerie little lamps and bright-eyed children, glass jars in hand, will pursue them across dewy lawns and twilit meadows.

There are several families of wood-boring beetles, the larvae tunneling through both living and dead trees. The long-horned sawyer beetles have antennae that are often longer than the length of their bodies. Some species remain in the larval stage for five or six years, and there are apparently accurate reports of adults emerging from furniture that had been in use for more than 15 years! No doubt the larvae were in the wood before it was cut into lumber and made into furniture, and the drying process may have prolonged larval development.

Another interesting wood-borer is the so-called death-watch beetle of the family *Anobiidae*. The adult makes audible ticking sounds — usually late at night — by striking its head against the side of its narrow tunnel in walls and old woodwork. Superstitious people believe that the sound is a warning of the impending death of a member of the household. Actually the sound is believed to be a mating call, and in daylight reason tells us that this beetle does not concern itself with the span of human lives. But in the unearthly stillness of a midnight hour, it is not difficult to imagine that some kind of death pendulum is swinging in the creature's brain and that someone's last hours are being counted off by the ticks emanating from the wood.

Among the many strange life stories that we encounter in the world of nature is that of the burying beetle of the genus *Nicrophorus*. These black beetles with elegant orange markings are specialists at locating and interring small dead animals, perhaps a bird, a mouse, a mole, or a chipmunk. Using the ultrasensitive chemical receptors located in the antennae, they patrol the woodlands in the late evening and twilight hours, acutely searching the night wind for any smell of death. Arriving at a carcass, a pair of beetles inspect the size of the body and the nature of the ground on which it lies. If too large, it is rejected and left for vultures and other scavengers.

Almost always the original pair is joined by other *Nicrophorus* beetles, sometimes as many as 10 or more. They all work together in a cooperative team effort either to move the body to a new location where the ground is softer or to bury it where it lies. The grave-diggers begin excavating at a feverish pace, undermining the soil beneath the carcass until it sinks lower and lower into the crypt, and the soil is filled in around and over it. Fights now break out among the cadaveric mob, growing more and more intense as the weaker beetles, one after another, make their departure. Eventually only a single dominant pair is left, and the female lays her eggs on or near the carcass. Their work now finished, the adults emerge from the murky tomb, to further wend their dark and secret ways among the dead. But behind them, the young larvae survive by eating the decaying flesh, and when the carcass has been reduced to a mere pile of bones, the larvae disperse, each to a pupal cell to complete its development in the soil.

The ground beetles comprise a large family, the *Carabidae*, with some 3,000 species in North America. They are well-armored hunters that scurry over the ground at remarkable speeds in pursuit of prey. In the dense woodlands of the Great Smokies and the Blue Ridge, the ground is covered with deep carpets of fallen leaves, tree branches and twigs that have accumulated over long periods of time. Here among the ancient leaf mold is found an almost endless variety of ground beetles, more, perhaps, than in any other part of America. An interesting member of this group is the snail eater of the genus *Scaphinotus*, a large black beetle with a violaceous iridescence that feeds on snails and slugs. The head is greatly elongated and the mandibles long and hooked, perfectly adapted for reaching down inside the curving shell of a snail and pulling out the unlucky victim.

Where are the beetles and other insects, we may wonder, when our lawns, driveways, and garden paths lie under heavy blankets of snow and bitter winds howl insanely through the bare trees. For beetles and all other insects, winter brings a suspension of life. The curtain of the year has fallen and the great stage is silent and empty. These creatures survive the ordeal in various and differing ways: some as dormant eggs; many as larvae or pupae in the soil or in sheltered crevices; others as torpid, hibernating adults in rotting logs or buried deep under the leaf mold. Thus beetles, and all the insect hordes, pass safely through the long night of winter to a new spring, and, in lengthening days filled with sunshine, will again rise up and possess the land. ⊠

***These burying** beetles of the genus* Nicrophorus *are gravediggers of the insect world. Using chemical receptors in their antennae to locate dead animals, they inter small carcasses and leave eggs to hatch in the makeshift crypt. The larvae of* Nicrophorus *feed on the carcass.*

***Fireflies, more** commonly known as "lightning bugs," are actually beetles of the family* Lampyridae *(above). Their ghostly glow is produced by the oxidation of the mysterious substance in their bodies called luciferin. These common black ground beetles (below) of the family* Carabidae *are plentiful in North America, with over 3,000 species found on the continent.*

Half of Known Species in Trouble

Freshwater Mussels Disappearing from State's Waters

Written and Edited by Vic Venters

Ever heard of an Atlantic Pigtoe? How about a Squawfoot? Or a Triangle Floater?

No, these aren't the names of popular new bass lures or professional wrestlers, they're species of freshwater mussels found in North Carolina. Although many of these mollusk species sport colorful sobriquets, they unfortunately face a very bleak future.

Recent surveys by N.C. Wildlife Resources Commission biologists show that there have been catastrophic declines statewide in native freshwater mollusks. Of the approximately 60 species found in the state, over 30 are in serious trouble and are candidates for North Carolina's list of species that are endangered, threatened or of special concern.

Even more disturbing is that these declines are occurring where there is little evidence of direct pollution or water disturbance. "You would expect to see declines where you have pollution," said John Alderman, freshwater biologist with the Wildlife Commission's Nongame and Endangered Species Program. "Unfortunately, we're also finding declines in waters that should be mostly pristine, in headwaters for example. That largely rules out potential causes such as wastewater treatment plants and runoff from farms and cities.

"This situation is extremely troublesome and very serious," added Alderman. Although biologists are not sure of the reasons, airborne pollutants seem the likely culprit. "It could be acid precipitation, heavy metal contamination, pesticides or road salt," Alderman said. "It's possible that the cumulative effects of acid precipitation are starting to modify rivers and streams in areas other than the Northeast."

Because mussels are filter feeders and have an extremely complex life cycle, they are good indicators of water quality. And like the proverbial canary in the coal mine, they are issuing a call of distress. A few of the problems include:

- Just a few years ago, eastern pondmussels were found in the Cashie River in Bertie County. "This year," Alderman reports, "the bottom of the river was essentially a desert. The only mussels found were two extremely old tidewater mucket mussels and reproduction has ceased in this area."
- In surveys of the Tar River drainage, only a few live eastern lampmussels were found and there were no signs of successful reproduction by this species.
- Another formerly widespread species, the yellow lampmussel, is not reproducing. In recent surveys of the Cape Fear River basin from the Virginia line to Wilmington, and in the Yadkin and Catawba rivers, the mussel has disappeared. Biologists are also unable to locate the mussel in the main channel of the Neuse River from Raleigh to the coast. Although live adults have been found in Neuse tributaries and the Tar River, Alderman reports no evidence of successful reproduction.

If pollution problems aren't bad enough, our native mussels are also threatened by a host of non-native, introduced mollusk species. Already the Asiatic clam has spread to North Carolina, and the zebra mussel, an exotic mollusk playing havoc in the Great Lakes area, is expected to spread down the Mississippi drainage. "I don't see any reason zebra mussels won't end up here," Alderman elaborated. "These species are pollution tolerant and are doing untold damage as they spread through native ecosystems."

Since 1986, biologists have conducted these surveys using funds from the state's Nongame and Endangered Species Fund. Most of these monies have come from contributions through the state income tax refund checkoff program for nongame wildlife. "These contributions are helping us list 200 species that are endangered, threatened and of special concern," Alderman said. "But it's just the first step. Financial support is needed to develop and implement management plans and to conserve critical habitats."

So what, you might say. Who cares about an obscure mussel with a weird name? Remember the canary in the coal mine. Life will also be duller, and certainly dirtier, without Appalachian Elktoes and their colorfully named cousins.

KEN TAYLOR

Disappearing Act: *About half of North Carolina's native freshwater mussels are in serious trouble. Recent surveys by biologists show that mollusks like this yellow lampmussel are not reproducing or are either disappearing altogether from waters across the state.*

Field Notes

Trout (General Waters)	Opens April 7
Trout (Native Waters)	Year-round
Wild Turkey (bearded birds only)	April 14 – May 12

Bear Cubs, Fawns Released in Fall

Caswell Facility Helps Injured, Abandoned Wildlife

Deep within the woods of Caswell County lies a haven for young deer and bear that have been injured or abandoned. Biologists with the N.C. Wildlife Resources Commission manage a rehabilitation facility that's located in the heart of the Commission's 16,000 acres of game lands. Public visitation is not allowed and hunting is prohibited in the 1,500-acre restricted zone located near Yanceyville.

Spring is a busy time of year for the biologists at the rehabilitation center as people begin encountering newly born animals. Although the rehabilitation center helps nurture abandoned or sick animals to the point that they can be released back into the wild, many animals are mistakenly picked up and turned in by people who think the animal has lost its mother.

"If you find an animal that looks as though it has been abandoned, but is otherwise OK, you should in all circumstances leave that animal alone," said wildlife biologist Harlan Hall. Usually the mother of an animal that appears to be abandoned is nearby, waiting for any humans to leave. Of the 40 to 50 deer that are turned over to the facility in a year, Hall estimates that two thirds of them probably didn't need to be there.

TERRY SHANKLE

Helping Hands: *Wildlife biologist Harlan Hall checks a tag identifying one of the fawns at the Caswell Wildlife Rehabilitation Facility near Yanceyville. Spring is a busy time of year for biologists at Caswell as injured young animals are turned over to the facility.*

Young deer and bear cubs that are injured or truly abandoned, however, are often picked up by wildlife officers across the state and taken to wildlife rehabilitators. Each of the state's nine wildlife districts has a network of approved rehabilitators who care for wildlife in distress. Every two weeks, wildlife management personnel pick up the young deer from rehabilitators and bring them to the Caswell facility.

Deer are held until the fall, usually October, when acorns and other mast are plentiful but the weather is not too cold. "Fawns are released when they've been completely weaned from milk," Hall said. "We take them to areas where they'll have the best chance of survival. Bears are usually released close to the area they came from."

Bears don't spend as much time at the facility as deer, and biologists are glad. "Bears are much harder to manage than deer," Hall explained. "They have sharp teeth and claws and can make a mess." The bears are kept in a 2-acre pen away from the deer.

Each animal is tagged and recorded by number. If the animal dies in captivity, biologists are able to determine the exact cause of death from a necropsy report.

—Angela Dorman Hill

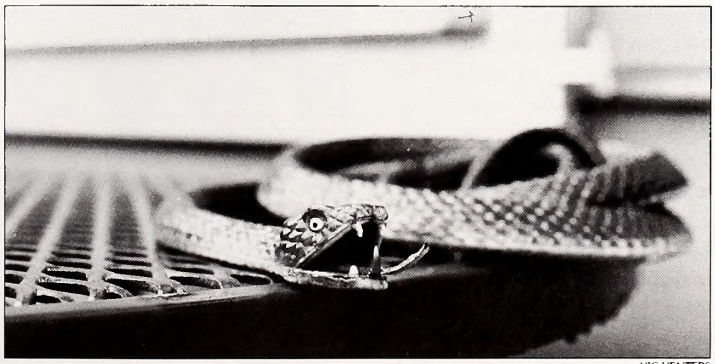
Hawk Silhouette Works Too

Fake Snake Keeps Birds from Windows

A rubber snake dangling on one of your window sills probably won't make a songbird very happy, but it just might save its life.

During spring nesting season, many species of birds become highly territorial and attempt to drive other birds away from their nests. Often songbirds mistake their reflection in the glass for an intruder and attempt to chase away the unwanted bird. The result? Broken windows and broken birds. Birds are often injured, and sometimes killed, when they decide your window is a good place to throw a body slam. Male cardinals, robins and bluebirds are often the victims of this misplaced aggression.

A few simple steps can prevent your neighborhood birds from becoming backyard casualties. Try placing a simple silhouette of a hawk or owl inside the window. Most songbirds aren't real smart, but few are stupid enough to pick on a hawk. Another option is to put a rubber snake on the windowsill. Yes, the neighbors will laugh, but even mercy has a price. This is sure to keep birds away, but remember not to place the snake too close to your feeder.



VIC VENTERS

Birds Beware! *This rubber snake might not scare you, but it could save a bird's life. In the spring, songbirds can become highly territorial and mistakenly attack their own reflections in a window. Fake snakes or hawk silhouettes near the window will keep many songbirds away.*

Special Management Area Proposed

Commission To Convene Small-Game Meeting

The hunting season's over, your guns are cleaned and it's time to recall fond memories and look forward to next year's hunts. North Carolina's small-game hunters, however, have had better years to remember as populations of quail and rabbits have been declining since the 1960s due to habitat alteration and other factors.

In an effort to reverse this trend, the N.C. Wildlife Resources Commission at its February meeting adopted the concept of a small-game improvement program. The first step in the proposal will occur later this year, when Commission biologists and representatives from approximately 20 other agencies and conservation groups meet to discuss viable options for improving small-game populations statewide. Conservation groups such as Quail Unlimited and government agencies such as the Soil Conservation Service will be invited, along with corporate landowners such as Carolina Power and Light Company.

The Commission also adopted the concept of establishing a 1,000-acre small-game demonstration area for landowners. As proposed, this demonstration area would allow interested landowners to observe a variety of management techniques that they could use on their lands to increase small-game populations. If funding can be appropriated, this management area would differ from the Commission's demonstration farms in that it would be on public land and would be specifically devoted to small-game management, rather than for wildlife habitat in general.

"In recent times we have not had any state-owned land where small-game management was the primary goal," said Carl Betsill, a small-game biologist with the Commission's Division of Wildlife Management. "That makes a big difference in how intensively you can improve habitat for small game."

In other Commission news:

- Public hearings have been scheduled to discuss the weight limit applied to black bears taken during the hunting season in North Carolina. Currently, the legal weight for harvested black bears is 50 pounds. Although no change in the regulations is proposed, the hearings would give the public an opportunity to comment on increasing the weight limit for bears. Both hearings will be held on May 2 at 7 p.m. One hearing is scheduled for Lenoir Community College in Kinston and the other is scheduled for Smoky Mountain High School in Sylva.
- The Commission's participation in installing a water-quality monitoring station at Currituck Sound was approved. For a three-year period, the Commission will contribute monies to monitor the salinity and flow of water from Chesapeake Bay in Virginia to Currituck Sound.

N.C. WILDLIFE RESOURCES COMMISSION

Rabbit Habitat: *This February, the N.C. Wildlife Resources Commission adopted a long-range planning program to help the state's small-game populations. The Commission will convene a meeting with various conservation groups, corporations and government agencies and is also considering the establishment of a small-game habitat project.*

Calendar

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before travelling to an event. Listings for the calendar should be sent at least four months in advance.

April 6-8
The 3rd annual Oak Hollow "Boat Float" will be held at Oak Hollow Lake in High Point. For more information on this boat show, contact Oak Hollow "Boat Float," 221 Nathan Hunt Drive, High Point, N.C. 27260, or call (919) 883-3486.

April 18-22
The 20th annual Grifton Shad Festival will feature over 25 events, including bass and shad fishing tournaments, parades, exhibits, food, contests and storytelling. For more information, contact Grifton Shad Festival, P.O. Box 928, Grifton, N.C. 28530, or call (919) 524-4356.

April 26-29
The N.C. Wildlife Federation's Spring Conservation Retreat at High Hampton Inn in Cashiers features sessions on fly fishing, outdoor photography, mountain folklore, wildflower identification and conservation topics. For more information, contact N.C. Wildlife Federation, P.O. Box 10626, Raleigh, N.C. 27605, or call (919) 833-1923.

May 4-6
The Outdoor Bowhunter Shoot at Charlotte's Mecklenburg Wildlife Club will feature a target-shooting competition that simulates bowhunting conditions. For more information, contact Jesse Smith, Mecklenburg Bowhunters, 7630 Holly Ct., Charlotte, N.C. 28227.

Public Asked to Report Strandings

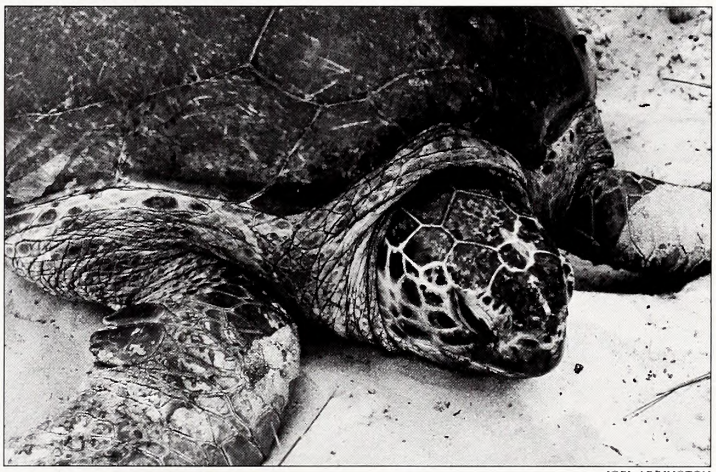
North Carolina's Sea Turtles Need Your Help

If you find a sea turtle washed ashore this spring, please report it. Biologists with the N.C. Wildlife Resources Commission are asking for the public's help in locating and reporting sea turtle strandings. When sea turtles are stranded, they're usually dead or injured and an increasing number of them are being found in inshore waters such as the Pamlico and Neuse rivers.

In addition to turtle monitoring by the state's Division of Marine Fisheries, members of the N.C. Sea Turtle Stranding and Salvage Network and Wildlife Resources Commission biologists are also conducting surveys to determine the number of strandings and their locations. Last year, 220 stranded turtles were reported in North Carolina. Of those, 48 percent were found in inshore waters.

"We want to let people know these animals are in the sounds," said Tom Henson, a Commission biologist who specializes in endangered species and is coordinator of the statewide stranding network. "We believe there may be a large number of stranded turtles that we never know about. Anyone who finds a stranded sea turtle should notify a local marine fisheries officer."

— Angela Dorman Hill



JOEL ARRINGTON

Turtle Trouble: *The Wildlife Resources Commission is asking the public to report any sea turtles they find stranded in inland waters. The Division of Marine Fisheries, the Wildlife Resources Commission and the N.C. Sea Turtle Stranding and Salvage Network are conducting surveys to determine how many sea turtles are stranded in the state each year.*

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Status on January 31, 1990

	Number Sold	Revenue Received
Lifetime Sportsman's Licenses	48,815	$17,954,564.89
Lifetime Hunting Licenses	622	171,898.76
Lifetime Fishing Licenses	3,758	848,433.23
Lifetime Subscriptions to *Wildlife in N.C.*	1,850	253,583.77
Contributions	—	168,702.34
Fund Total	55,045	$19,397,192.99
Total Interest Earned		$5,258,394.95

Number of Hunting Fatalities Falling

Blaze Orange Reduces Accidents

Hunting-related deaths and accidents have dropped since 1987, when the N.C. General Assembly required big-game hunters to wear a blaze-orange cap or garment when hunting. As state lawmakers across the nation have passed mandatory blaze-orange laws, the number of hunting fatalities in which the victim was mistaken for game has fallen. This season, six fatalities were reported.

During the 1986-87 big-game hunting season in North Carolina, nine fatalities were reported. The number fell to six in 1987-88 after passage of the law. During 1988-89, eight deaths were reported, well below the state's record high 19 deaths in 1964.

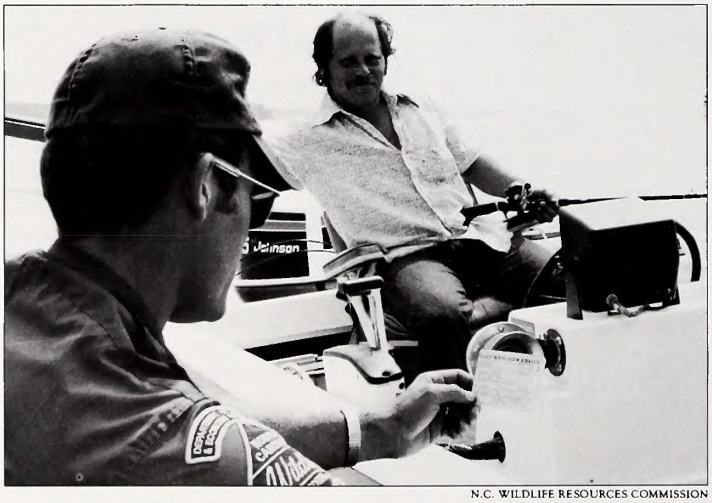
This year, four of the fatal accidents involved deer hunting, one involved dove hunting and one involved squirrel hunting. Of the 25 nonfatal accidents reported through December 29, only three occurred while hunting small game.

Wildlife officers hope that mandatory hunter safety education will further reduce the number of accidents. When a new law takes effect in 1991, a first-time hunting license buyer must show proof that he or she has passed a hunter safety course offered by the Wildlife Commission. Already, 385,000 North Carolina school students have been trained in hunter safety. The courses are offered statewide and information is available through a local wildlife officer or the Raleigh office.

— Angela Dorman Hill

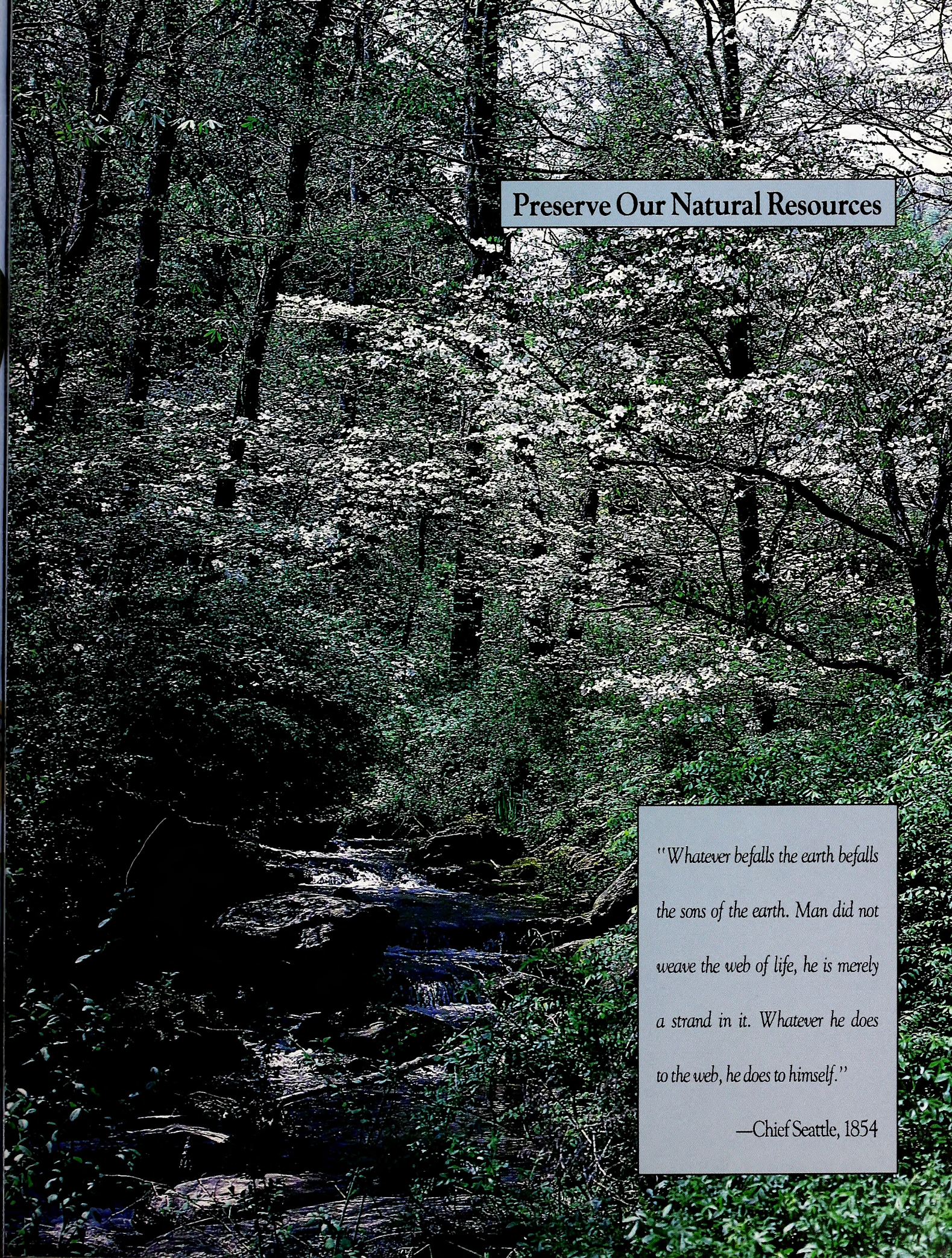
Register All Motorized Boats

Is Your Boat Legal To Launch?



N.C. WILDLIFE RESOURCES COMMISSION

Registration Time: *Before you hit the water this spring, be sure your boat is legal. All motorized boats in North Carolina — including those using electric motors — must be registered, not just those 14 feet or over as incorrectly stated in a boat registration photo caption in February's issue. Registration is required for all sailboats over 14 feet in length at load waterline. Don't forget your personal flotation devices, either.*



Preserve Our Natural Resources

"Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself."

—Chief Seattle, 1854

Beautiful Beetles

These handsome lady-bird beetles add color to nature's palette, and are fierce predators that help control many harmful insects.

LITHOGRAPHY BY EDWARDS & BROUGHTON COMPANY, RALEIGH, NORTH CAROLINA

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WILDLIFE IN NORTH CAROLINA

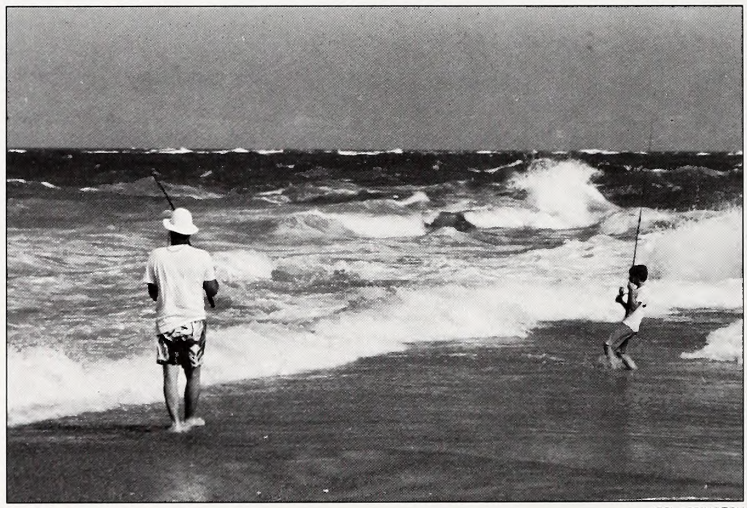
MAY 1990 75 CENTS

Surf Fishing The Simple Way

by Jim Dean

"Nah, they ain't biting," said the fisherman as he knelt on the beach and baited his hooks with some ripe shrimp. "I've been fishing here for a couple of hours, and I've caught only two crabs."

He wasn't alone. More than half the fishermen I'd talked to during my 3-mile walk had caught very few fish. But I'd also seen plenty of coolers full of spots, pompano and big sea mullet. Why the big difference? Those who weren't catching fish were making three very common mistakes. Many weren't using fresh bait, and some were using the wrong bait. Most were also casting as far as they could throw, well beyond the inshore break where the fish were congregated. Finally, many were fishing stretches of beach that didn't have a good slough.



JOEL ARRINGTON

The truth is that many of us don't fish the surf often enough to learn how. We try it once or twice a year, usually during vacation, and often with indifferent success. That need not be the case, however, if you remember a few simple tips.

Tackle is the first consideration. Contrary to popular belief, you do not need a long, heavy surf rod for such fishing. Any relatively stout 6- to 7½-foot freshwater spinning rod balanced with an open-faced reel filled with 10- to 12-pound test monofilament will serve well unless the surf is abnormally rough. You probably already have such an outfit, and it will easily handle bottom rigs and sinkers up to 2 ounces (3 ounces if you don't overpower your casts). Such a rod is also versatile enough to cast spoons, plugs or jigs in case blues, Spanish mackerel or sea trout show up.

Most of the time, you'll be fishing bait on a simple, 2-hook bottom rig (the kind most beach tackle shops sell). Long-shanked No. 5 hooks are a good choice for most bottom-feeding panfish, though you may want to switch to larger hooks for bluefish or sizeable flounder. Get an assortment of pyramid sinkers from 1 to 3 ounces. You'll find you use 2-ouncers most often.

You don't need a lot of other gear. A sand spike to hold your rod is nearly essential, as are needle-nose pliers, a knife and sunglasses. You might also want a towel, suntan lotion and a cold drink. Many fishermen carry all their gear in a small cooler because it keeps drinks and bait cold, but a plastic bucket works fine.

One of the biggest mistakes is using the wrong natural bait or bait that's not absolutely fresh. Shrimp is by far the most common bait, and it works well for spots, sea mullet, croakers, pompano and most other bottomfish. But if you buy it at a pier or tackle shop, it's less likely to be fresh. You want bait that's fresh enough for human consumption, so buy it at a seafood market. Look for shrimp that is a translucent green — not reddish — and smell it. If it has a strong odor, look elsewhere. Be sure to peel the shrimp before you use it. Cutting each shrimp into short chunks will make it last longer.

Bloodworms are also excellent bait, especially for spots, though somewhat expensive. You can often find an even better bait for spots, pompano and sea mullet right in the backwash. Look for mole crabs — often called sand fleas — that have recently molted and have soft shells. You may have to dig for them with your hands or a shovel. Most you find will have hard shells, but they aren't nearly as effective as soft-shelled fleas. For bluefish, one of the best baits is cut mullet, the fresher the better. Flounders prefer live shrimp or live finger mullet, but can be caught on a strip of flounder belly, and sometimes on a strip of mullet.

Don't assume that it doesn't matter where you fish. Most surf fishermen simply walk to the water and heave their bait as far as they can cast. Unless you're uncommonly lucky, that's two mistakes. If you stand on the higher dunes and look at the surf, you should notice an offshore sandbar parallel to the beach where the waves are breaking. Ideally, you want to pick the spot that has the deepest slough between the sandbar and the beach.

Even here, in many cases it will pay to make short casts directly under or just beyond the shore break. Pompano, spots, sea mullet and flounder are more likely to be close in, and it's easy to cast too far. Bluefish, on the other hand, are more likely to be farther out in the deeper part of the slough.

One other simple tip should help. Get a tide table for the area you're fishing and use it. You're likely to discover that the best fishing often — but not always — occurs just before high tide, and again just before low tide. If those tidal periods take place in early morning or late afternoon, all the better.

This summer, when you take your annual beach vacation, try these simple tricks. After you've caught all those fish, wash the salt off your rod and reel with fresh water, then squirt both with WD-40. Then, everything will be ready next summer when it's vacation time again.

May 1990
Volume 54, Number 5

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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How do fish find their way in the trackless oceans? What little we know is truly astonishing.

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A stick that suddenly starts walking can introduce you to a world where survival depends on camouflage, imitation and deception.

DEPARTMENTS

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Back Of The Book *by Vic Venters*

Cover *A colorful, nonpoisonous corn snake suns itself on a rock shelf. Photograph by Melissa McGaw.*

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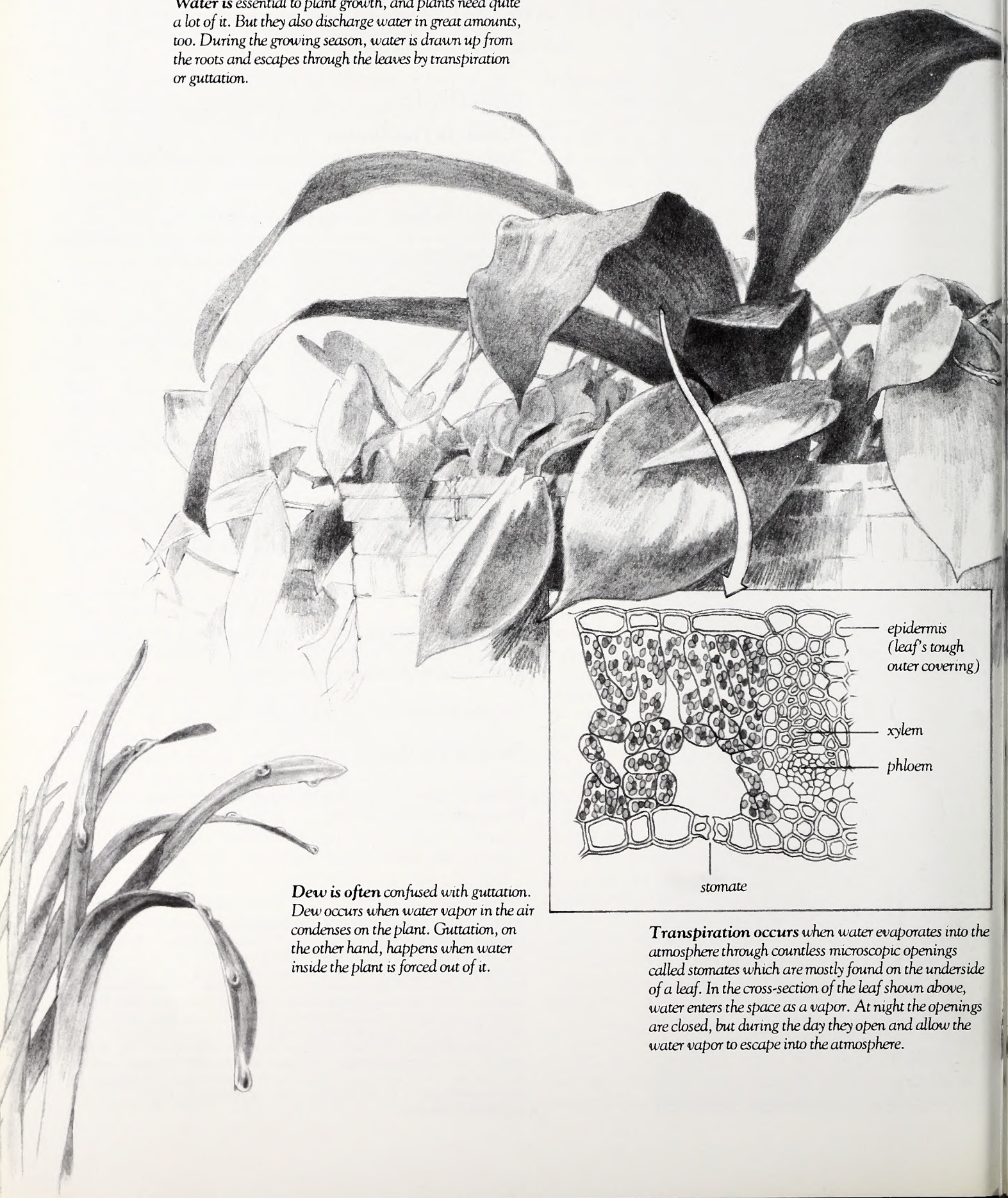
Water is *essential to plant growth, and plants need quite a lot of it. But they also discharge water in great amounts, too. During the growing season, water is drawn up from the roots and escapes through the leaves by transpiration or guttation.*



Dew is often *confused with guttation. Dew occurs when water vapor in the air condenses on the plant. Guttation, on the other hand, happens when water inside the plant is forced out of it.*

Transpiration occurs *when water evaporates into the atmosphere through countless microscopic openings called stomates which are mostly found on the underside of a leaf. In the cross-section of the leaf shown above, water enters the space as a vapor. At night the openings are closed, but during the day they open and allow the water vapor to escape into the atmosphere.*

The Prodigal Thirst of Plants

written by Lawrence S. Earley / illustrated by David Williams

***The tiny globes** of water hanging from the tips of this strawberry plant show the effects of guttation, another way that plants discharge water. Guttation occurs at night, when, under pressure from the roots, water is forced out through special pores at the leaf tip or margin.*

The coiled hoses on our backyard spigots at this time of year are a reminder of what thirsty little devils plants can be. Animals need water, too, but pound for pound, they use far less of it than plants. While animals recirculate most of the water they drink in their blood and other body fluids, plants discharge it almost as fast as they take it in.

The main way that plants discharge water is through transpiration, one of nature's basic processes and one of the most important. Through the plant's intricate plumbing system, water is carried from the roots to the leaves and distributed throughout each leaf via a network of small veins that lead to microscopic openings on the leaf surface called stomates. As water reaches these openings and is exposed to air, it evaporates. This steady discharge of water vapor into the air from leaves is what transpiration is all about.

Surprising amounts of water are sometimes involved. A single corn plant will transpire two quarts of water in a day, an acre of corn 300,000 gallons in a growing season. Indeed, plants transpire over 90 percent of the water they take in.

Plants also lose water by a different process called guttation, although much less water is involved. On the other hand, you can see guttation at work whereas transpiration is completely invisible. On spring mornings, look for little globes of water hanging from the tips and margins of plant leaves. On leaves with serrated edges, the effect can be spectacular as rows of tiny droplets seem like ornaments on a Christmas tree.

Many people mistake these droplets for dew. The effects of the two phenomena are similar, yet dew happens when water vapor in the air condenses on a blade of grass or a leaf, while guttation is caused by something that happens within the plant itself.

Indeed, transpiration and guttation are both internal processes that can occur in the same plant but not at the same time. Transpiration occurs by day; guttation is generally nocturnal. It happens when pressure builds up from the roots during periods when transpiration has slowed or stopped (nighttime or days of high humidity), forcing water out of the plant through pores located at the tips and margins of leaves. It used to be thought that this pressure from the root system was what caused transpiration. After all, how else could water get to the top of a 100-foot-tall tree? But it turned out that root pressure didn't explain it at all, and now scientists believe that water is pulled to the top of a tree rather than pushed.

To understand this you must understand one of the most useful properties of water itself — cohesion. Cohesion is the force that makes water molecules adhere to each other as if they were attached by Velcro. Inside the narrow, threadlike tubes that carry water up a plant, the cohesive force of water is tremendous indeed. As some water molecules evaporate through the stomates, they exert suction on the others behind them. Thus, from the roots to the top of the tallest tree, water exists in an unbroken column that is continually pulled upward and outward.

Plants may almost seem wasteful when it comes to water, yet not only does transpiration provide us with most of the oxygen we breathe, but it also enables carbon dioxide to be absorbed by the leaf. Without it, photosynthesis wouldn't occur, and without photosynsthesis we wouldn't have green plants, and without green plants... well, you get the idea.

Wildlife In The Nineties

Tough issues face the 13 wildlife commissioners in this new decade. Meet the people who will tackle them.

by Jim Dean

What lies ahead for North Carolina's wildlife? What changes can we expect? Which programs are having an impact; which need more emphasis? These are questions being asked and considered by the people who will have a particularly significant impact on the answers — the 13-person board that sets policy for the N.C. Wildlife Resources Commission.

The Wildlife Commission is the official state agency charged with ensuring a future for the state's wildlife. That responsibility is carried out by a staff of 485 employees involved in management, research, regulation, enforcement, education and administration. It includes not only game species (those for which we hunt and fish), but also nongame species, including those that are threatened or endangered.

It is, however, the appointed commissioners who establish the direction of this agency. Recently, Robert E. Barnhill Jr. of Tarboro, current chairman of the Commission board, discussed his views of the role of the board and assessed some of the issues he feels will be significant in the coming years. He began with the regulatory process.

"Many groups and individuals are doing great work cooperating with us on wildlife conservation projects," said Barnhill, "and we value this effort and want to continue to encourage it. I feel, however, that we still need to do a better job of getting everyone to understand what we can and cannot do. This is especially true in establishing regulations where there may be conflicting interests from various groups. We will do all we can to make sure everyone gets a chance to provide input and receive a fair hearing. Of course, we must then balance this against the needs of the resource. We want those who are providing this input to know that we may sometimes have to rule against their wishes. Yet, even where that may be necessary, we want to continue to be able to work with them and have their confidence and support.

"We've got commissioners all over the state — one in each of nine districts, plus four at-large commissioners — and one of the important purposes of this arrangement is to give each area a voice," said Barnhill. "This is a big state, and situations and needs are different in various parts. We evaluate each of these situations and do the best we can. When sportsmen and others understand our regulation process, it makes it easier for all concerned to work together and achieve the best results.

KEN TAYLOR

Commission Chairman *Robert E. Barnhill Jr. (left) and Executive Director Charles Fullwood preside over a recent monthly meeting of the N.C. Wildlife Resources Commission.*

"One step we intend to take to give people better access to this process is to hold more of our meetings in different areas of the state instead of in Raleigh," he said. "This will give more people an opportunity to attend and learn who we are and what we're doing.

"The second area I feel we need to work on — and it's so basic that it sounds almost like a cliche — is habitat," said Barnhill. "We must protect what we have and manage it to the best of our ability. One answer is to continue to encourage volunteer work, and the efforts of private and public landowners. For example, the Department of Transportation could be encouraged to substitute warm-season grasses for fescue in their plantings because they provide better wildlife food and cover. We could encourage power companies to do the same, and this could be done without a lot of money.

"Volunteerism is already helping us with the 'Adopt an Access Area' program, and within a few years, we anticipate that 75 percent of our boating access areas will be kept clean by volunteer groups. Certainly, there are other areas where volunteers could be very helpful."

Barnhill pointed out several specific goals he feels are important to the agency, and headway is already being made on some of them.

"We've got a very good hunter-safety program underway," he said. "The mandatory requirement that big-game hunters wear blaze orange is already showing a marked improvement in reducing hunting accidents and fatalities. With the new mandatory requirement that hunter-safety training be completed prior to obtaining the first hunting license, sportsmen will be even better trained. Already, hunting is a statistically safe sport, and it will become even safer.

"My personal feeling is that one of our most important long-range goals is working with schools to increase public understanding of wildlife and the natural world," said Barnhill. "By doing so, we are creating a foundation for the future. It is a sad fact that

KEN TAYLOR

***Assistant Director** Richard B. Hamilton makes a presentation to the Wildlife Commission in the agency's conference room in its Raleigh offices. The paintings on the wall are originals of prints offered as part of the agency's stamp and print program.*

many young people today do not know, and are not taught, very much about the intricate biological balance in the natural world around them. Already, the agency's effort in training teachers through Project WILD is having a good impact, and I believe this kind of effort needs to grow."

Dwindling populations of many small-game species have long been a concern of sportsmen and the agency, a concern that Barnhill recently saw reflected in a meeting in Tarboro that was held to show farmers and landowners how they could better manage their lands for the benefit of small-game species like bobwhite quail and rabbits.

"The interest in improving small-game habitat is so great that 100 people attended this one meeting," said Barnhill. "I was impressed with that turnout and the information that was passed along, and I think we need to provide similar opportunities across the state."

Barnhill cited two specific goals that he feels will be important in the near future. The first is the need for a new warm-water fish hatchery. "The agency's hatchery at Fayetteville is inadequate," he said. "Development around it prevents its expansion and has also affected water quality. We need to move this hatchery to a place where it can better meet our needs for the future.

"We are also trying to revitalize the Wildlife Foundation to encourage more donations so that we will have the funds to operate and expand as such needs arise," he added.

Barnhill also took note of the changing role of the agency in the protection and management of nongame species, including threatened and endangered species. "We're getting more and more into management and care of the whole ecosystem. It's a natural role for us because our agency already has the expertise and experience to manage wildlife and protect and improve habitat. By far the greatest number of wildlife species are classified as nongame, meaning no one hunts or fishes for them. These species need our help, and by helping them we also help game species. It all works together. If you improve water quality for largemouth bass, you also improve water quality for such species as the spiny mussel, and that works in reverse, too.

"I feel, however, that we should be careful when we declare a species endangered," he said. "We should seek a balance between the needs of such species and ecologically sound development. We have a responsibility to both wildlife and the economic well-being of the state.

"We in North Carolina are a lot better off than many states because we have so many natural resources and so much wildlife," Barnhill said. "There's a small element that would like to eliminate hunting and, at the other extreme, a small element that would like to disregard all regulations. But the vast majority of our citizens either enjoy hunting and fishing or have no objection to either, and this majority wants to protect and enhance all our wildlife resources.

"We've made some major strides environmentally in North Carolina and the nation to clean up pollution and protect wildlife habitat," he said. "As long as we work on those problems by continuing to monitor the resource and improve habitat, I think we can look forward to an excellent future."

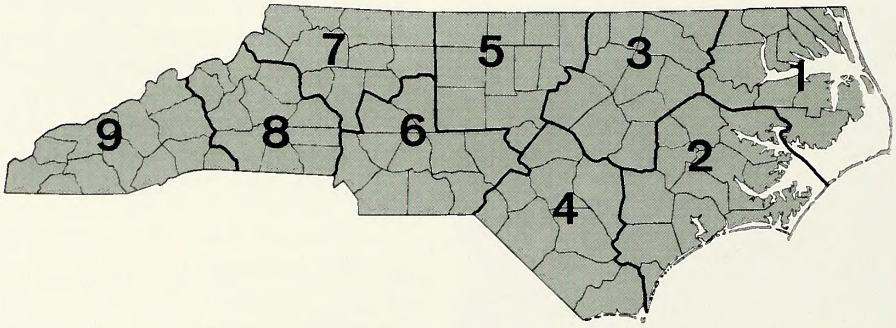
Meet The Commissioners

Robert E. Barnhill Jr. *is chairman of the Commission and an at-large appointee of Governor James G. Martin. He is a general contractor and lives in Tarboro. He is concerned about loss of hunting areas and the decrease in populations of some game species. He is also a strong supporter of hunting-safety programs, and his hobbies are hunting and fishing.*

Eugene Price *is vice chairman of the Commission and commissioner of District 3. He is editor and vice president of the Goldsboro* News-Argus. *He is particularly interested in the Wildlife Commission's enforcement program. His hobbies and interests include hunting, fishing, camping, sailing and making working duck decoys.*

Susan L. "Sunny" Allen *is the appointee of Speaker of the House Josephus L. Mavretic. She is an instructor in the Department of Zoology at N.C. State University in Raleigh. She is concerned about habitat destruction from development and decreasing access to wildlife resources and also supports efforts to achieve improved communication and cooperation between the nonhunting public and the Wildlife Commission. Her hobbies and interests include horses, bird-watching, gardening and hiking.*

Wildlife Commission Districts



When the N.C. Wildlife Resources Commission was formed in 1947, the state was divided into nine Wildlife Districts, each represented by a commissioner appointed by the sitting governor. This basic arrangement continues to the present, and gives all parts of the state an opportunity to provide input on wildlife regulations, management, enforcement and other agency activities. In 1977, four additional commissioners were added to the board; two appointed at-large by the governor, one by the Speaker of the House, and one by the Lt. Governor. District commissioners are appointed for 6-year terms, while at-large commissioners are appointed for four years and legislative appointees serve 2 years. Shown are the agency's present board members, including the commissioners that serve each wildlife district.

The Wildlife Commission meets regularly, usually monthly, to set policy for the agency's professional staff. Each spring, the Commission holds regional or district hearings to propose changes in hunting, fishing and trapping regulations, and to gather input from sportsmen and others concerned about North Carolina's wildlife resources.

Russell Maughn Hull Jr. *is commissioner for District 1. He is vice president of Carolina Feed and Seed Co. and McPherson Beverages and manages his family farm in Elizabeth City. He is concerned about loss of wildlife habitat, declining water quality and abuses by unethical hunters and fishermen. His hobbies and interests include snow skiing, saltwater fishing, golf and skeet shooting.*

Joseph Andrew Neisler Jr. *is commissioner for District 8. He is a textile executive and sod farmer from Kings Mountain, and he is concerned about the loss of wildlife habitat and water and air pollution. His hobbies and interests include hunting, fishing and coordinated deer and timber management.*

Ferrell L. Blount III *is an at-large appointee of Governor James G. Martin. He is chairman and president of an agricultural holding company with diversified financial interests in Bethel. He is concerned about the allocation of scarce resources, and his hobbies include a wide range of outdoor interests.*

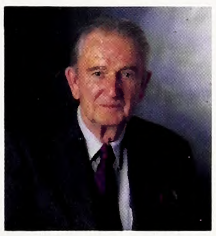
Richard P. Budd *is commissioner for District 7. He is president of Budd Services Inc., a company providing multiple services in cleaning, landscaping and agriculture in Winston-Salem. His hobbies and interests include hunting, fishing, swimming, boating, scuba diving, racquetball, running and farming.*

Ovide E. de St. Aubin *is the appointee of Lt. Governor James C. Gardner. He is a retired apparel manufacturer in Siler City. He is concerned about diminishing public and private fishing and hunting areas, and current attitudes against shooting sports. His hobbies and interests include hunting, shooting, hand-loading, gun collecting and travel.*

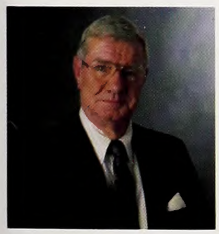
E. Richard Jarrett *is commissioner for District 5. He is a retired lieutenant with the Wildlife Commission's Division of Enforcement and currently a property management agent in Haw River. He is concerned about loss of wildlife habitat and has taken an active interest in hunter safety and enforcement. His hobbies include hunting and fishing.*

Ted B. Lockerman *is commissioner for District 4. He is an attorney-at-law in Clinton. He is concerned about preserving existing wildlife habitat and expanding natural resources education for young people, and he supports an increase in enforcement personnel. His hobbies and interests include fishing, hunting and church work, and he serves as a member of the Sampson County Board of Commissioners.*

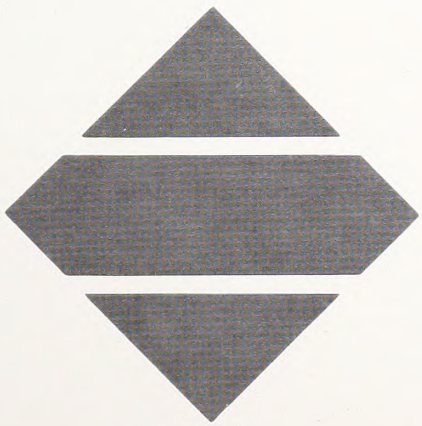
Dr. William H. McCall *is commissioner for District 9. He is a retired physician in Asheville and is concerned about halting the long-term decrease in wildlife, especially small game species, and finding solutions to this decline. His hobbies and interests include hunting, fishing, field trials and other outdoor activities.*



Stuart R. Paine *is commissioner for District 6. He is a former manufacturer of furniture and housewares, and he is currently involved in product marketing, investments and commercial and industrial real estate development. His interests include hunting, fishing, gardening, decoy collecting and charitable fund- raising.*



Roy Gerodd Sowers III *is commissioner for District 2. He is an attorney-at-law in Burgaw, and he is concerned about destruction of wildlife habitat, the decreasing populations of small-game species and the lack of public understanding of the role sportsmen play in wildlife management. His hobbies and interests include big-game hunting and bass fishing.*



MAYFLY MADNESS

If you think mountain trout love mayflies, you've never seen bass and panfish gobble these delicate insects on warm-water lakes and rivers.

written and photographed by Pete Elkins

Ephemeridae! The very word, for a Romantic poet, transports one to a land of waking dreams, enchantment and magic. Translated from Latin to common English, the word means mayflies, and for an angler like me, that means the most exciting fishing of the year.

Mayfly hatches on North Carolina rivers and lakes are one of those mysterious annual events that follow an internal calendar. This clock controls the arrival of hickory and white shad into tidal rivers, the beginning of the year's chimney swift migration and the arrival of bluefish on the Outer Banks.

Biologists would tell us that the events are functions of water temperature, light periods, sun angle and similarly intricate laws of nature. Despite a scientific explanation for the mayfly hatch, I prefer to believe that it occurs in some magical way solely for the benefit of anglers.

Mayflies are one of the most widely distributed insect families in North America. Although the larval nymph form is an important food for freshwater fish, the adult insect is the one that provides the dramatic surface action associated with the spring and early summer hatches.

The life cycle of a typical mayfly is a fascinating one. Typically, mayfly eggs produced the previous summer hatch into nymphs that feed through the winter months. In early summer, the nymphs molt into the initial winged version of the mayfly. The subimago or dun emerges from the water's surface or crawls out where it waits in shoreline vegetation for the final molt into the adult spinner or imago. Adult mayflies have no mouths; their sole purpose is procreation. After breeding, the spinners fall "spent" to the waters surface.

Trout anglers know all about mayflies. Indeed, much of the fly-fishing mystique is grounded in imitating the mayfly in both larval and adult form. A vast array of famous, time-proven artificial flies like the Hendrickson, Quill Gordon, Light Cahill and thousands of other patterns are all mayfly imposters.

Mayfly hatches are so important in some areas that trout anglers time their trips to maximize chances of being on the water when the emergence or "hatch" is on. For North Carolina trout fishermen faced with patchy mayfly populations in freestone waters, mayfly hatches are nice to have, but not as important as they are in trout waters elsewhere.

Warmwater anglers are generally more cavalier about the mayfly hatches with one major exception: bluegill or "bream" fanatics love to encounter them on ponds, lakes or rivers. If you haven't fished for bream when mayflies are doing their fleeting mating dance on and above the surface, you've missed the best show in town.

Not surprisingly, a mayfly hatch creates perfect conditions for a fly rod. For the most part, bluegill and other sunfish have completed their spawning cycle before the first significant mayfly activity occurs. Consequently, the mayfly hatch creates a brief replay of the good surface fishing often found during the peak of spawning.

Even the big purple-masked bull bream that can be so finicky on other occasions become reckless when the mayfly hatch is on.

It's easy and fun to get caught up in the "match the hatch" syndrome when bluegills are popping spent mayflies on the surface, but it's not essential. Bream are not usually selective about mayfly imitations. In fact, some of the most productive mayfly-hatch fishing can be enjoyed using a small chartreuse, rubber-legged popping bug that really doesn't imitate any real insect.

The only conditions for super sunfish action seem to be the presence of the hatch itself and a lure roughly the same size as a mature mayfly. A closer imitation becomes a little more important when presenting subsurface lures. Still, even below the surface, a close imitation is good enough for panfish.

Fly fishermen should avoid imparting too much action to a surface lure. For the most part, the fish are taking spinners that have already mated and have fallen nearly lifeless back to the surface. Astute anglers should closely study the surface-feeding fish to determine if they are feeding on emerging insects

When hatching *mayflies flutter from the water's surface to nearby foliage (opposite page), panfish, bass and other species often go on a feeding spree. Though more often associated with mountain trout waters, mayflies are also common on many warm waters. When they hatch, anglers can make good catches of fish like this fat bluegill (above).*

or spent ones. On occasion, larger bluegills, especially in relatively clear water under bright sunshine, may avoid the surface and feed only on emerging nymphs enroute to the surface. Fish feeding on nymphs near the surface often create disturbances that make you think they're feeding on top. If that's the case, a "buggy" looking nymph may produce more saucer-sized fish. Often, however, there's no reason to go below the surface.

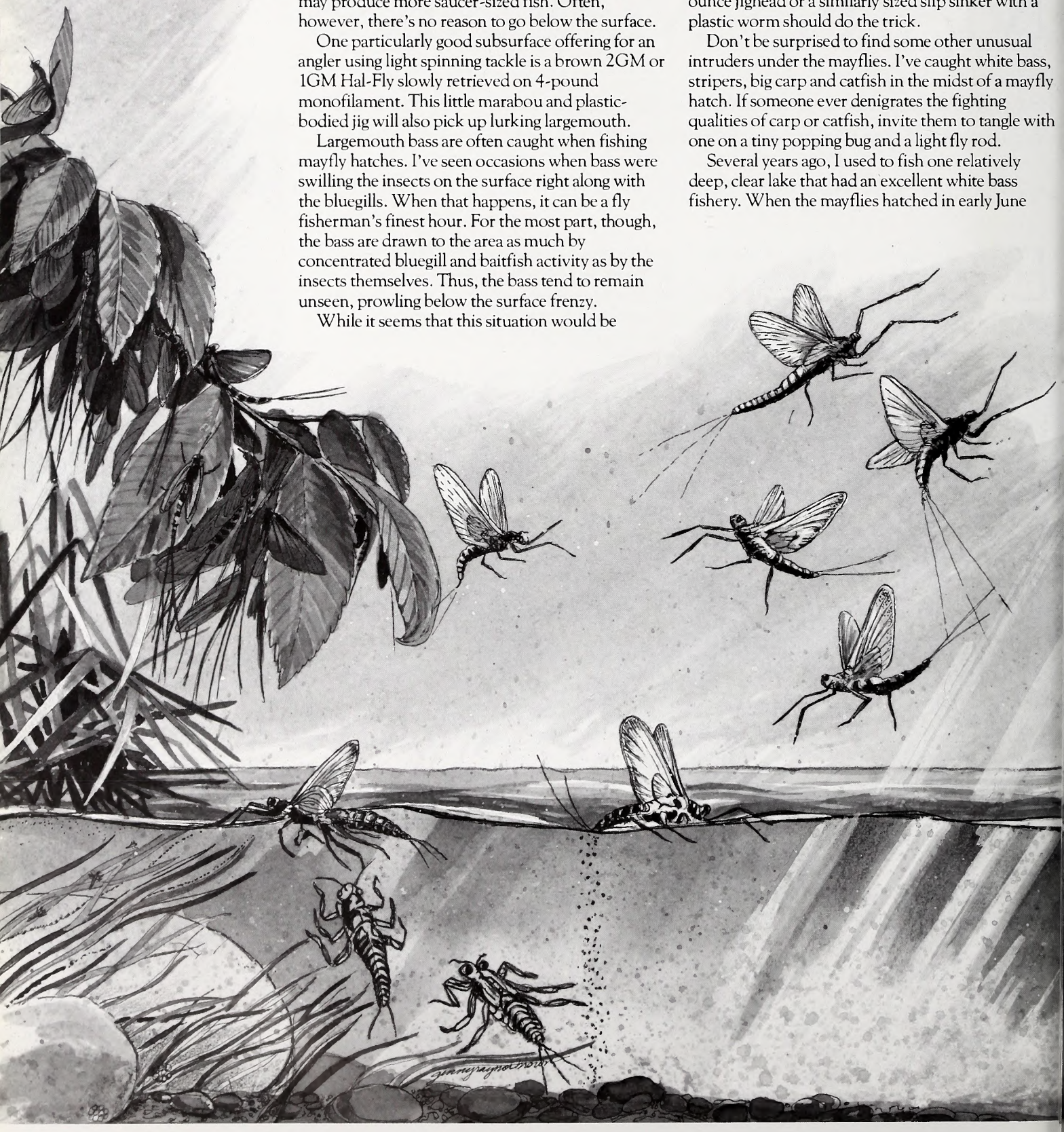
One particularly good subsurface offering for an angler using light spinning tackle is a brown 2GM or 1GM Hal-Fly slowly retrieved on 4-pound monofilament. This little marabou and plastic-bodied jig will also pick up lurking largemouth.

Largemouth bass are often caught when fishing mayfly hatches. I've seen occasions when bass were swilling the insects on the surface right along with the bluegills. When that happens, it can be a fly fisherman's finest hour. For the most part, though, the bass are drawn to the area as much by concentrated bluegill and baitfish activity as by the insects themselves. Thus, the bass tend to remain unseen, prowling below the surface frenzy.

While it seems that this situation would be perfect for a topwater bass lure, that's rarely been the case for me except on cloudy, overcast days. Generally, a plastic grub or 4- to 6-inch plastic worm is more productive. Cast to the center of the mass of mayfly activity and retrieve slowly along the bottom. Watch for strikes as the lure sinks. It's a good idea to use the lightest weight practical; a 1/8-ounce jighead or a similarly sized slip sinker with a plastic worm should do the trick.

Don't be surprised to find some other unusual intruders under the mayflies. I've caught white bass, stripers, big carp and catfish in the midst of a mayfly hatch. If someone ever denigrates the fighting qualities of carp or catfish, invite them to tangle with one on a tiny popping bug and a light fly rod.

Several years ago, I used to fish one relatively deep, clear lake that had an excellent white bass fishery. When the mayflies hatched in early June



along the deeper shorelines, the fishing was memorable. Big white bass fed like eager sunfish at the peak of this hatch. Unlike bluegills, the white bass were undaunted by lure movement. I would cast a small popper near a mayfly, twitch it once, and a foot-long white bass would invariably inhale it. If the action dwindled, we would move in closer to the bank and rake the overhanging limbs and branchs with a paddle. This stirred hundreds of resting mayflies back into the air or knocked them into the water. Then, we simply moved back out to comfortable fly rod range and waited a few minutes for the whites to notice the sudden increase in food.

This self-help approach is especially effective whenever mayflies are present but not actively moving in the air. If you notice a tree or bush along the bank that has a brown "burned" look, move in for a closer look. You may discover hundreds of mayflies clinging to the vegetation. If so, a few well-placed swipes with a paddle or rod tip may stir up some fast local action, especially for bluegills or shellcrackers.

Be careful not to stir up more than you bargained for. I've never had it happen, but the unwary could make contact with a wasp or hornet nest with disastrous results. Once, I shook an unhappy, wrist-thick serpent into my boat. Things were a bit tense until my partner and I identified it as a water snake and not a cottonmouth.

While sunshine seems to act as a catalyst for the hatching process, don't neglect fishing the mayfly hatch at night. As good as daylight fly rod activity can be, there's something addictive about night fishing during a period of mayfly activity. Much of the addiction arises from the "things that go bump in the night" atmosphere of a lake after all the water skiers and other boaters have left.

The key to getting in on exciting night action is lighted docks. Mayflies swarm around the lights, and baitfish and gamefish follow. I know some folks who say that crappies won't hit a jig at night, but anyone who says that just hasn't tried a mayfly-infested dock. Pay attention to the pattern of light on the water. The insects and smaller baitfish will be in the lighted area. As a general rule, bluegills, crappies and bass will be along the darker borders of the illuminated area.

Anglers focusing on bass in the shadowy areas often use plastic worms. Another good choice is the little brown Hal-Fly discussed earlier. An almost exact imitation of mayfly size and color, this little jig is easy to swim just under the surface to attract strikes from suspended fish waiting for mayflies or smaller forage fish. Crappies are suckers for the little jigs at night. Bluegills and bass are no less vulnerable.

There's another attraction to this nocturnal mayfly business. Since the best hatches in lakes are in late May or June, fish have already moved into postspawn patterns, during which docks in relatively deep water play an important role. In lakes with striped and white bass populations, anglers who focus on these deeper-water docks or those adjacent to river or creek channels may get a hefty bonus around the mayfly-littered lights. On some nights, you can actually see big stripers, white bass and largemouths prowling the late-night mayfly cafeteria. Best of all, they will inhale the little jigs.

Locating good mayfly hatches isn't usually too difficult, especially if you know when and where they occurred the previous year. Given generally similar weather and water conditions, they will repeat the cycle every year. If you don't have a track record to go by, engage in some tactful inquiries at tackle shops and marinas, or talk to the nearest game warden or fisheries biologist.

Once you're on the water, it's easy to spot an active mayfly hatch. There will be a cloud of insects and rising fish. Watch for that "burned" look on shoreline vegetation even if you don't notice flying insects.

The unfortunate side of mayfly madness is its ephemeral (pardon the pun) nature. Mayflies emerge and rise in a magnificent mating dance and, destiny fulfilled, they quickly die. So, too, does the fishing. By careful plotting, it's possible to flit from lake to lake in tune with the hatches. Sadly, few of us have time to do so. Besides, the hatches on most North Carolina waters occur about the same time locally, although they do vary some.

But then, mayfly madness, like glory, is a fleeting thing. Enjoy it while you can. ☒

***There are** many species of mayflies found in both cold and warm water. After spending a year or more living beneath the surface, the nymphs hatch on the surface into the winged dun or subimago stage and seek refuge in nearby foliage. Overnight, the dun metamorphoses into the adult spinner or imago, a change most noticeable as the opaque wings become translucent. The spinners then gather over the water to mate, and the females lay their fertilized eggs in the water. The entire emergence and reproductive cycle normally lasts but 24 hours. The spinners then die, often falling to the surface where fish feed on them. Trout, bass and panfish also feed on the hatching duns and nymphs.*

ILLUSTRATION BY GINNY R. BROWN

All Things Cold & Slithery

Herpetologists aren't bothered by that late unpleasantness in the Garden of Eden. Welcome to their world of snakes and turtles, frogs and toads, newts and salamanders.

VIC VENTERS

by Vic Venters

Welcome to the lower vertebrate unit at North Carolina's Museum of Natural Sciences in Raleigh. Take the steps down to the basement, hang a right, go to the end of the hall, then turn left. Watch your step; it's dark and cluttered down here. Jars of pickled reptiles, fish and amphibians are everywhere, some filling gray steel shelves and others spread, seemingly haphazardly, across the floor and on tables. On a dusty plastic drum, a dried snapping turtle carcass reposes, its jaws forever locked in a grin. Fading photos of snakes stare back from the walls and a dry film of fine dust covers the tables. The air holds a faint odor of preserving alchohol.

"Excuse the mess, we've got a real space problem down here," says Alvin Braswell, one of the unit's curators. He sweeps a pile of papers to the side of his desk and settles into his chair. Alvin is slim but hardly fragile. He looks to be just a normal guy, despite the rather peculiar environment in which he works.

The museum's lower vertebrate unit deals with the reptiles, amphibians and freshwater fish found in North Carolina, explains Alvin. The unit has two curators, Braswell and Bill Palmer, and their duties include helping with the museum's educational programs and exhibits, as well as doing research on the state's various "critters," as Alvin calls them. While their work is highly varied, Alvin admits that they are best known for being "snake men." "If you mess with these things much, snakes are what you are remembered for," he says.

Bill Palmer arrives to join the conversation. He's limping, having pulled a muscle running to a car in a rainstorm. Bill is the chief curator of the unit.

Both men admit to being bitten at an early age by the urge to collect and study snakes and other creatures. Palmer, now 54, leans back in his chair and looks up at the ceiling. "There used to be so many snakes, even around Raleigh," he recalls, a wistful smile appearing. "In grade school at recess, I used to go out and collect small earth snakes and brown snakes. We could go out on an April day and collect 50 or more. They are still around, but not nearly in the numbers they used to be."

As kids, most boys saved their spare change to buy a baseball glove, or perhaps a bicycle. Bill bought a snake. "I remember working at the Tip Top Grocery and making enough money to buy a boa constrictor," he says. "When that thing got out in the house one time, it caused quite a stir. Fortunately my parents were very patient with my interests."

Alvin, 42, admits his youth was similarly spent. He grew up in a small farm community in rural Union County. Back

VIC VENTERS

***Alvin Braswell** lets his fingers do the walking on the mucky bottom of a Carolina bay. These shallow depressions are host to a tremendous number of amphibians and reptiles. This southern cricket frog* (Acris gryllus) *is a common resident of bays in eastern North Carolina (above).*

MELISSA McGAW

***When not** in the field, the curators for the lower vertebrate unit at North Carolina's Museum of Natural Sciences spend much of their time researching and cataloging the various reptile, amphibian and freshwater fish species found in the state. Curator Bill Palmer (right) shows a pine snake* (Pituophis melanocleus) *that has been at the museum for almost two decades.*

then, he set rabbit boxes to provide some extra meat for his family. "Our family wasn't rich by any means so we didn't have a lot of money to spend on books," he explains. "All I had was some of those little Golden Nature Guide books that I'd pick up at the local barber shop. They weren't much, but they were better than nothing. Man, I wore a couple of those out."

Because he was a native of Raleigh, the Natural Sciences Museum caught Bill's eye early. "They say I used to come in here as a very small child and throw peanut hulls all over the floor," Bill says. Endless enthusiasm and countless trips to the museum allowed Bill to develop close relationships with its personnel. "When I was about 14 or 15, I went on a bird banding trip to the coast with Harry Davis, who was then director of the museum," Bill recalls. "On the way down, he saw this big copperhead crossing the road. We stopped the car, but the snake was about to get away. He went right out there and put his foot down on him. The snake turned around and bit him. I was terribly frightened but Harry seemed unconcerned. I didn't know he had an artificial leg."

In the early 1950s, Bill began work at the museum as a laborer. After leaving for part-time stints at the Baltimore Zoo and graduate work at N.C. State University, he returned to the museum in 1962. His title was a little more lofty this time. "I believe I was called curator of zoology," he says. Today, Palmer says, he's trying hard to complete a new book, a scientific treatise to be titled *Reptiles of North Carolina*. In his years at the museum, he's also been the author of numerous scientific articles on reptiles and is the co-author of the book *Reptiles and Amphibians of the Carolinas and Virginia*. He's been gathering information for his new book since the early 1980s. "Finishing this book is my first concern right now."

While Palmer got an early start at the museum, Braswell's relatively isolated rural

surroundings kept him away from people with similar interests. "I was a sophomore at N.C. State University and was pretty discouraged that I hadn't found others like me," Alvin explains. "Finally, I caught a hognose snake on a trip home and I brought it up to the zoology department. I held it up to the secretary and said, 'Who is interested in this?'"

Alvin grins. "After recovering, she guided me down to Professor Bernard Martof. He was a nationally recognized herpetologist, and I think he realized my enthusiasm. He introduced me to a lot of people, including Bill Palmer.

"First time I met Bill I came into this office, and he had a little dried carcass of a fer-de-lance (a venomous South American snake) over there," Alvin says, pointing to Bill's desk. "I knew exactly what it was and told him so. Years later, Bill told me that he was amazed some kid from the boondocks knew what it was." Like Bill, Alvin began working with the museum on a part-time basis as an intern before coming aboard full-time in 1974.

While research forms the bulk of a curator's work, calls from the public also occupy his time. "We just had a call from a man complaining about a snake loose in his store," says Alvin. "He couldn't let his customers in. That's part of our job. Typically, we get calls from people saying they've found a snake skin in the attic or have a snake in the yard. Usually, they want to know how to get rid of it.

"What we try to do is get people to describe the snake. Most are non-poisonous, and we tell them to just leave it alone. If there is obviously a poisonous snake involved, we try to go out and take care of it to make sure someone doesn't get hurt. Otherwise people start pulling out guns and doing a variety of crazy things."

Still, when it comes to snakes, people do crazy things. "I got a call from down near Kinston one time," Alvin says. "The people on the phone were totally irrational. Their old frame house was full of rat snakes (a harmless, non-venomous snake). I couldn't reason with them at all. I later learned they burned their house down."

Right now, however, all Alvin wants to do is get out in the woods. "I've got some field work with the Carolina crawfish frog that I've got to complete," he emphasizes. He's working on several state and federally funded programs to determine the status of this rare and elusive species found only in the eastern part of the state.

Bill looks up from his research and glances over to Alvin. "I don't do much field work any more," he says. "I leave that to the younger guys."

On a warm, sunny Friday in February, we "younger guys" are on the road, heading south down Highway 421 towards several crawfish frog sites below Clinton. "The crawfish frog has habitat requirements very similar to the tiger salamander," Braswell explains, occasionally glancing sideways toward boggy sites beside the road. "They usually start to breed in March, but this warm weather might have them moving. They need isolated bays or wetlands that are fish-free. Behaviorally, their tadpoles just don't seem to be adapted to escape from fish."

The car rumbles over one of the countless blackwater streams that meander through eastern North Carolina. "Good place for a water snake," he says. "Before I was married, I was with Anne (then his fiance) and I saw this water snake down in the pool under that bridge. I went down to catch it."

One of Braswell's techniques for catching a water snake is to grab it by the tail and sling its head back between his legs, pinning it between them. It didn't work on that occasion. "When I pulled the snake toward me, its head went through my legs and it grabbed my rear and began chewing furiously."

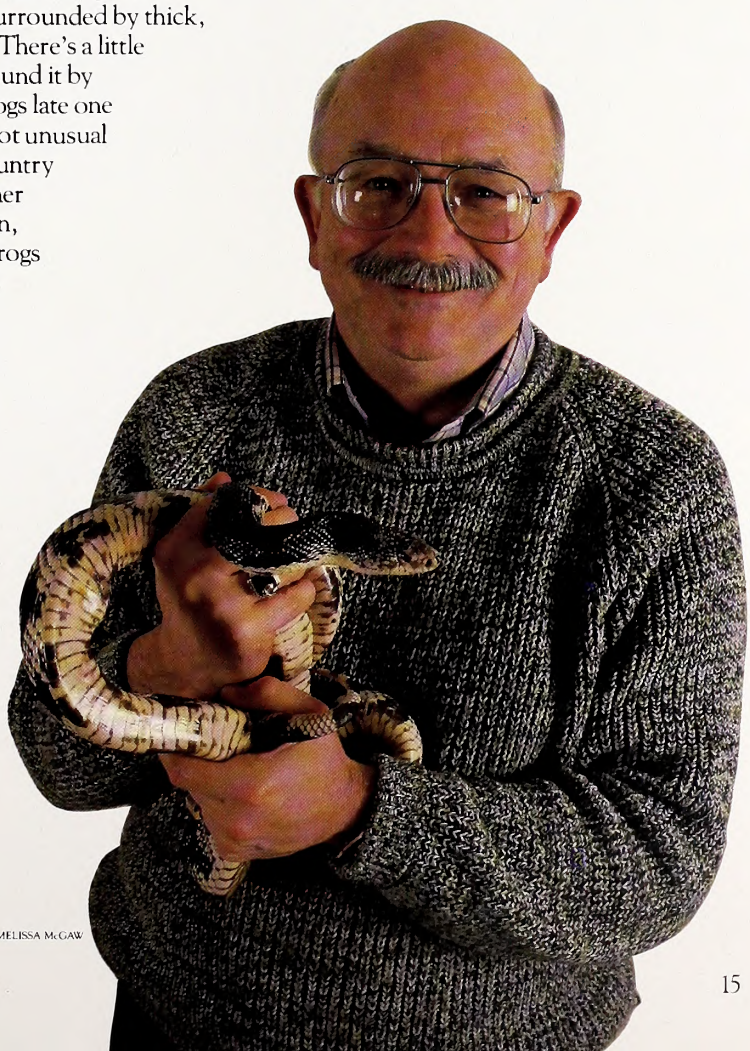
"Anne was in tears with laughter," he recalls, chuckling.

He pulls the car over and stops. Both sides of the road are surrounded by thick, swamp-like terrain. "There's a little pond back there — found it by listening for calling frogs late one summer night." It's not unusual for Alvin to cruise country roads on sultry summer nights, windows down, listening intently for frogs to betray their unseen homes.

A wall of green-brier tears at our clothes as we trudge toward the pond. Alvin isn't wearing snake boots. "I don't own an official pair of snake boots," he explains. "Of our poisonous snakes, only a big diamondback would worry me. If I see a poisonous snake and need to catch it in a hurry, I don't hesitate to step on it. It'll try to chew on my boot but can't bite through."

Ahead, a flash of sun on water points the way to our destination. Braswell's pace quickens noticeably. "This is a new borrow pit," he says, pointing to recently disturbed earth. "It's got good potential for the crawfish frog. Doesn't look like it's got any fish." He kicks his way through the ankle-deep water and takes a pH reading to test the water's acidity. "We'll check it in another year. Looks like a good habitat for pygmy rattlers, too," he adds. "I've never been bitten by a poisonous snake. I've had some that were real friendly to me though," he laughs.

As you might expect, Braswell's got a bevy of snake stories. We stumble up the embankment to the car. "I found a rattlesnake crossing the road a few years back and all I had to put it in was a pressed paper minnow bucket," Alvin begins. "I set the bucket up in the back of my station wagon and put a rock on the lid. All was fine until I hit a railroad track.



MELISSA McGAW

***Braswell searches** his net for the tadpole of the crawfish frog* (Rana areolata). *Like many of the state's reptiles and amphibians, this rare and elusive species is declining because of continued habitat destruction.*

"Kerplop, I heard the bucket turn over. I pulled over and saw the snake resting back there by the bucket. When I tried to catch it, it shot over the back seat under the front seat."

What followed was a piece-by-piece disassembly of the car. "I took out everything except the front passenger seat. Still no snake. I got down on my knees and peeked under the seat, and just as I was looking around, the snake popped out. There I was, nose-to-nose with a rattler. Instead of biting me he made a run for the dashboard, but I managed to pin him. I was a little more careful with the bucket the next time."

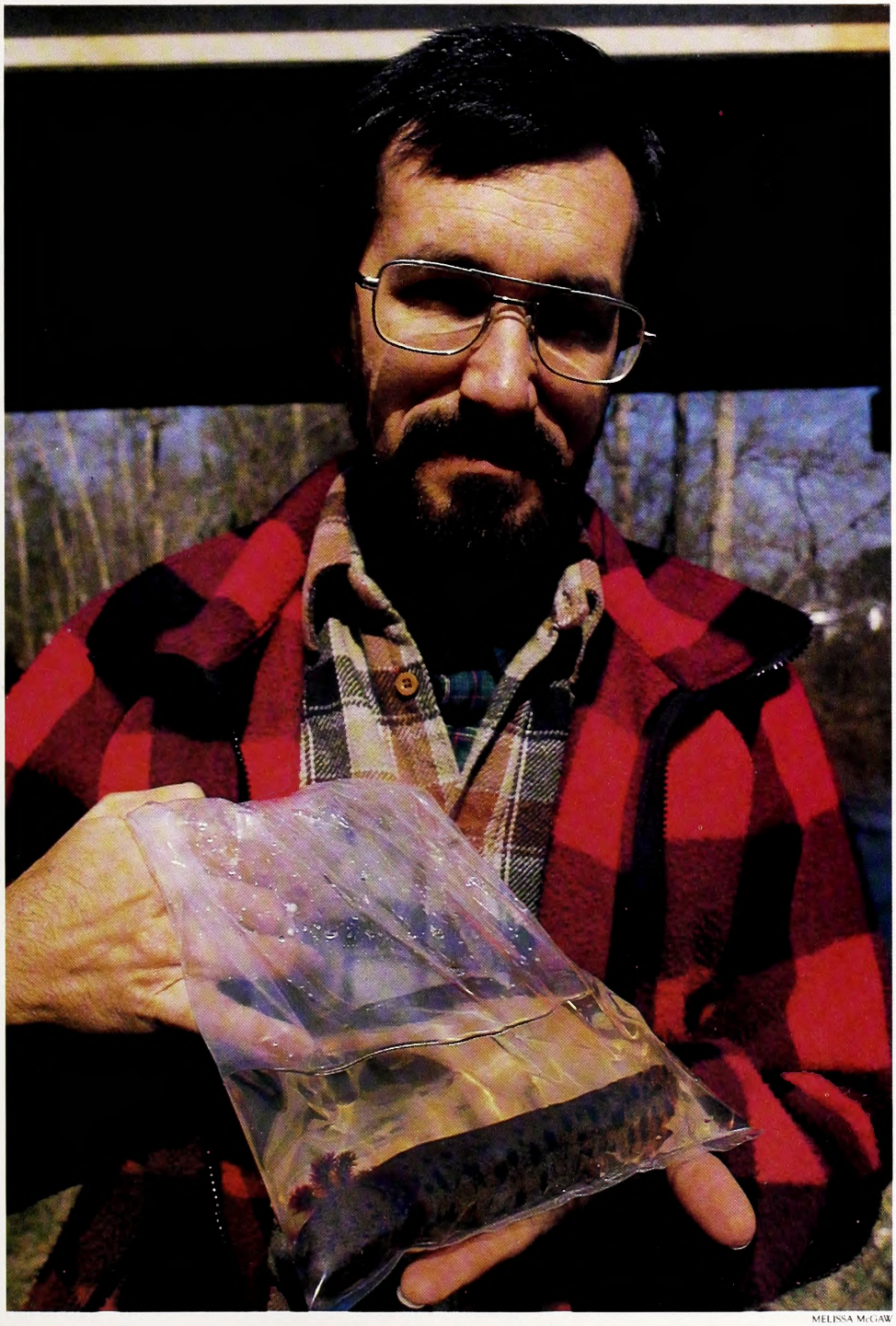
A couple of stories and two Carolina bays later, we begin a trek across a pine forest to another bay. The Carolina bay we have just left was a disappointment, Alvin admits. "That place was known as one of the best breeding sites for Carolina crawfish frogs," he says. Despite this year's heavy rains, it was almost dry. The crawfish frogs weren't using it and Alvin found only tadpoles of some common species and a few broken-striped newts. "The hydrology of this region confounds me," he admits.

This site, however, looks splendid. It is a shallow depression, maybe 3 or 4 acres in size, and full of water. Hundreds of spring peepers chirp in chorus together. Braswell begins to seine. There is plenty of aquatic activity, to be sure, but no crawfish frog tadpoles to be found. "They're either not here or not moving yet," Alvin says.

Surveying the pond, he points to an old attempt at a drainage canal. "Look at the old ditch over there," he says. "That's one reason the crawfish frog is in big trouble. It's hard to find a bay that hasn't been ditched and drained or deepened and stocked with fish."

On the ride back to Raleigh, Alvin stops the car by a small twisted form on the side of the road. It's a road-killed black racer, another victim of the 20th century. Braswell begins writing in his notebook. "It's a common snake but because it's moving around at this time of year I'm noting it."

I ask if it was intentionally run over. Braswell shakes his head. "No way to tell. People are taking a more enlightened view of snakes, but its going to be a long, long time before snakes are viewed as just another animal out there. They've got so much stacked against them — tradition, religion.



MELISSA McGAW

***This Neuse River** waterdog* (Necturus lewisi) *is another example of a North Carolina amphibian species in trouble because of loss of habitat and pollution problems in its watershed.*

And identification is a real problem."

Braswell jots down a few more notes. It's been a nice day in the sun, but his work is hardly over. There will be field notes to analyze, formal reports to file, more research to do.

"You know, I wouldn't trade places with anyone, though," Braswell says as he gazes over the landscape. Yes, he admits, there are long hours in the field and longer hours writing about his findings. But that goes with the territory. "I might make more money at a university, but at the museum, we've got the freedom to turn our attention to affairs that might really need attention.

"Changes are coming fast to North Carolina," Alvin continues. "Populations of reptiles and amphibians are suffering. Continued growth means more habitat destruction. What's left is being increasingly fragmented." He glances at the flattened snake again, then puts the car in gear. "I've got work to do." ⊠

Mysteries of Migration

How do fish find their way in the trackless oceans? What little we know is truly astonishing.

written and photographed by Joel Arrington ©1990

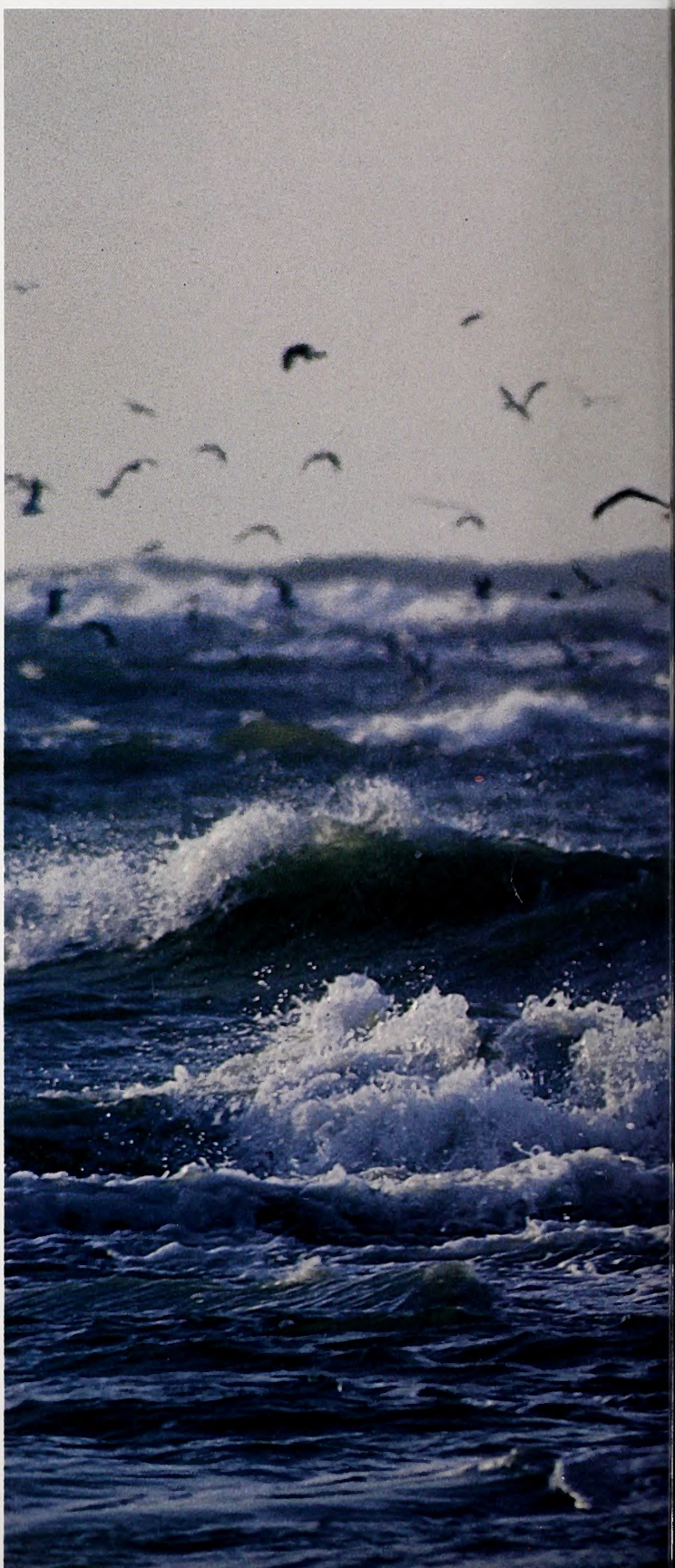
We marvel at annual returns of migrating fish. How can they do it? How can fish wander the open ocean for years, then find the very stream where they were spawned to complete their life cycle? How can tiny fish larvae, spawned at sea, find their way against currents to nursery estuaries?

Early man came to depend for survival on returning schools of shad, striped bass and salmon. In modern life, understanding the mechanisms of fish migrations has huge consequences for commerce and recreation, for conservation and management policy, as well as for tactics and strategy for commercial exploitation. Yet the answers to most of our questions remain beyond our grasp. Science is just beginning to comprehend some of the many factors involved in fish migrations, "the comings and goings with the seasons on a regular basis," as they have been described.

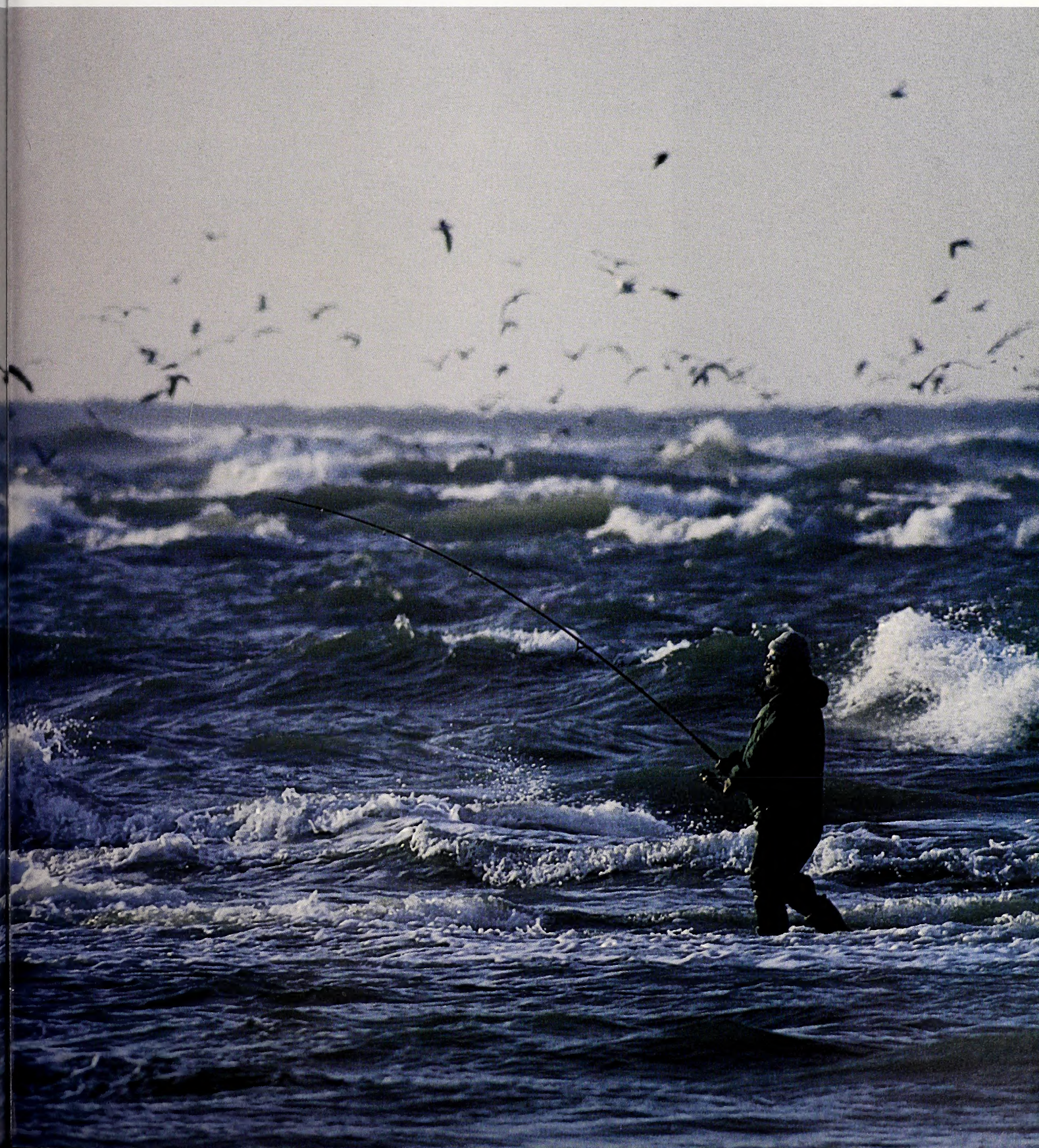
Definitions vary, but when most scientists speak of migration, they mean a return to a previous location, not just a movement in one direction. For example, when herring move to the surface at night to feed and return to the depths in daylight hours, these movements are considered migrations. But mere dispersals for food are not migratory. However migration is defined, scientists admit that their knowledge of it is woefully incomplete.

Some species exhibit schooling behavior so that great numbers are massed together during seasonal migrations. That's usually what we think of when we imagine migration: salmon or herring, for example, in large, dense schools. But numbers of tiny fish larvae and juveniles also travel inconspicuously in the ocean and sounds in movements so essential to abundance and even to their survival that interruption of these migrations may court disaster for the species or for commerce—or both.

We rejoice in the precise timing and predictability of migrations, which might be regulated by water temperature or by the length of the day. Cobia migrate up the Atlantic coast every year from Florida and anglers in state fishing tournaments can expect to begin catching big fish in April. Catches continue to increase through June, then decrease through October, and only an occasional cobia is likely to be found on offshore wrecks near the Gulf Stream late in the year. Red drum spend the warm months inshore and in the sounds, then winter off the North Carolina and Virginia capes. Anglers catch the bigger fish primarily as they move along barrier islands and around inlets in spring and fall. Speckled trout begin



***Success for** this solitary angler fishing the surf on the Outer Banks will often depend upon the migration patterns of various gamefish and the forage they eat.*



***Even in** the open sea, species like this leaping sailfish follow certain migratory routes that are related to water temperature, spawning instincts, food and other possible influences. Many of the mechanisms that guide migration are still not well understood.*

to exit North Carolina sounds in late summer when water temperature falls to about 75 degrees Fahrenheit. Fishermen have come to depend on that exodus. Seasonal events reassure us that, within certain limits, the universe is predictable and dependable, a comforting conclusion.

We stand in awe of the resilience of fish species that make long and arduous journeys. Some, like our herring and shad, move across great ocean expanses and up difficult rivers, many now blocked by dams and other man-made structures. We marvel at the speed of fish like the bluefin tuna, some of which migrate from Florida to Norway, a distance of over 10,000 kilometers in a straight line, at an average rate (over two to four months) of five kilometers per hour. We regard with wonder the endurance of fish like salmon that against all odds swim up swift rivers overcoming waterfalls many times higher than the length of the fish.

Why migrate at all? Why don't fish just stay put? Jimmy Buffet sings of "...going where the weather suits my clothes" and hints at why fish migrate. It is an effort to find the optimum environment and maximize comfort. If the environment and the fishes' needs were constant, they wouldn't need to migrate. But conditions change over time, partly as a result of fishes' behavior. Fish consume oxygen and food, attract predators, produce waste. In addition, the set of conditions required or preferred by fish can change from day to night, from season to season, and from larval stage to adulthood.

As fish species evolved, individual fish that could regulate their environments on a timely basis survived to reproduce. These species came to rely on sign stimuli to direct their movements appropriately. Scientists believe that among the cues that might trigger migration in fish are bottom topography, polarized light, currents, surface swell, celestial bodies, the earth's magnetic field and odor clues imprinted on young fish.

Two other theories deserve elaboration. One researcher has proposed a theory that chemical components, such as salt, and fine suspended particles in the water column may give fish cues as to which direction to head. The theory has not so far been demonstrated. A second unproven theory, inertial guidance, is a complex idea first described in 1873. Say you had a boxcar sitting on a track with a steel ball hanging from the interior roof. Say an engine gave the car a boost to start it down the track. The ball would swing to the rear and back. As the car is nudged down the track, turning left and right, slowing, accelerating, the ball registers each external force and swings accordingly. Now suppose there was some way to record in the ball each of those changes in terms of both force and direction. Then you would have data from which you could calculate the boxcar's exact location. Inertial guidance in fish would work in a similar way, relying, it seems to me, on a mechanism by which the fish could learn or inherit data from which it would sense its optimal direction.

Heady stuff, but throughout the technical literature we find suggestions of such esoteric notions as a map sense and an internal compass in fish.

Tagging studies have shown that American shad, like salmon, return to the river where they were hatched to spawn. They approach their spawning grounds in waters whose temperatures are between 13 degrees and 18 degrees Celsius. This means that while shad begin to spawn in spring in Florida, the southern limit of their range, they don't spawn in Canada, their northern limit, until late summer.

To nomadic fishes like billfish and tunas, "home" is not a fixed geographic place, like a river, but a restricted set of preferred physical, chemical and biological conditions. This set of conditions shifts in regular fashion owing to annual weather cycles. For example, the acknowledged best late-summer location in the western Atlantic Ocean for marlin and tuna is a narrowly defined area roughly off the Virginia-North Carolina border. Prevailing southwesterly winds of summer from off the land blow the warm surface water offshore, causing upwelling of cool, nutritious waters from the depths off the Continental Shelf. This upwelling is met by nutritious water flowing from Chesapeake Bay at a time when elsewhere off the U.S., water temperatures are edging toward the top of the range that offshore pelagics will tolerate. Billfish, dolphin, tuna and wahoo

concentrate where bait has grown in this nutritious water and where the temperature is beneficial. In their usual summer range between Cape Cod and Cape Hatteras, white marlin, for example, find these more favorable and comfortable conditions by migrating.

Just how fish organize their behavior to accomplish their comfort goals remains largely unexplained. Yellowfins, which like most other tunas migrate widely through the world's oceans, were discovered to have crystals of a ferromagnetic material, magnetite, in tissues within their sinuses. Experiments have demonstrated responses in captive fish to magnetic fields. We know that the earth itself is surrounded with a magnetic field. It makes our compasses point north. Scientists speculate that tunas and certain other pelagic fishes may use the geomagnetic field to guide their migrations.

Work on grunts in the Bahamas indicates potential use of local landmarks, a sun compass and a sense of distance. From deep offshore locations where they spend the daylight hours, schools of grunts were observed to move together along a consistent route toward nocturnal feeding stations. As each reached its accustomed location, it left the group, like a commuter from a train, to take up its station. At dawn the procession began in reverse.

Migrations can be classed as alimental (for the purpose of food procurement), climatic (for purposes of reaching a better climate), or gametic (for purposes of reproduction). They are also divided into open ocean, coastal and estuarine, and river migrations.

The open ocean is dominated by gyres, or large-scale eddies. Distribution of certain fish stocks appears to be closely related to these gyres. Dr. Bori Olla, a fish behaviorist now specializing in salmon at Oregon State University Science Center, told me about a large school of giant bluefish that was observed one spring in a Gulf Stream gyre with a school of blue sharks. Because the water temperature outside the gyre was so different from the temperature inside, the big blues would not break through the thermal walls, he said, even though the sharks were preying heavily on them.

Giant bluefish migrate south in the fall to escape low temperatures and a scarce food supply, bringing them from New England to the waters off North Carolina. Migrations are cued, researchers tell us, by temperature and light. The length of day is an important cue, they say, and in the lab, exposure to light has been shown to stimulate hormonal changes in fishes.

Scientists distinguish, too, between active and passive migration. Drift of eggs and larval fishes is a part of migration and plays an important role in the life cycles of the top five North Carolina commercial species. Spot, menhaden, croaker and two species of flounder together make up 85 percent of this state's commercial catch. They spawn in winter near the Gulf Stream and the progeny migrate about 100 kilometers to major inlets, then into estuarine nursery areas, like Rose Bay in Pamlico Sound, a distance of another 100 kilometers. Subadults migrate out of the nurseries in the fall; adults migrate offshore in fall and winter to spawn.

How can juvenile fishes, just a fraction of an inch long, travel that far? John M. Miller, James P. Reed and Leonard J. Pietrafesa, of N. C. State University, determined that by vertical movement alone, juvenile fish can hitch a ride on currents that will take them to the coast. Differences in wind direction (offshore or onshore) and differences in water temperature (actually water density) make tremendous differences in the speed and direction of currents. A five-day winter storm, with typical northwesterly wind direction, the researchers showed, can transport juvenile fish across Pamlico Sound on the bottom currents, which flow in a direction opposite that of the wind. Using a current model, these researchers can account for over half of the yearly variation in numbers of juvenile spot in the nursery areas.

Because fish stocks of the Gulf of Mexico and eastern U.S. are dependent on estuaries, migration is a key element in their life histories. How successfully young fish make those migrations each year determines year-class strength and, eventually, abundance of the species.

The details of how they migrate remain largely a mystery that is unraveling a frustrating strand at a time. We must learn the answers, though. The success of saltwater fish management depends on it. ⊠

***Like other** anadromous fish, hickory shad spend much of their lives at sea, but enter the sounds and climb rivers in the spring to spawn in fresh water. How they find their way is not just a matter of curiosity; it is also of critical environmental and economic importance in ensuring their survival.*

SURVIVING BY TRICKERY

written and photographed by Harry Ellis

Harmless "horns" *of the hickory horned devil intimidate predators.*

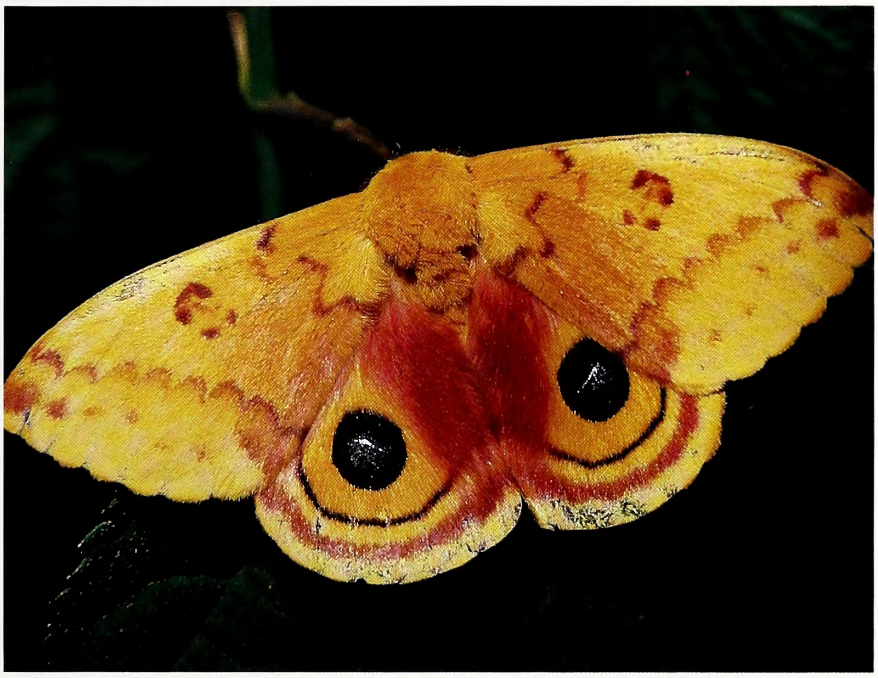
A stick that suddenly starts walking can introduce you to a world where survival depends on camouflage, imitation and deception.

We live in a world teeming with life, vibrant with the sounds and activity of living things. Life abounds in variety and numbers beyond calculation, not only in tropical rain forests and jungles but in our own fields and woodlands as well. There is birdsong and beehum and the motion of a billion furred and scaled and feathered creatures. Frogs clatter from the marshes and foxes bark in the moonlight. This immensity of life outnumbers man a billionfold.

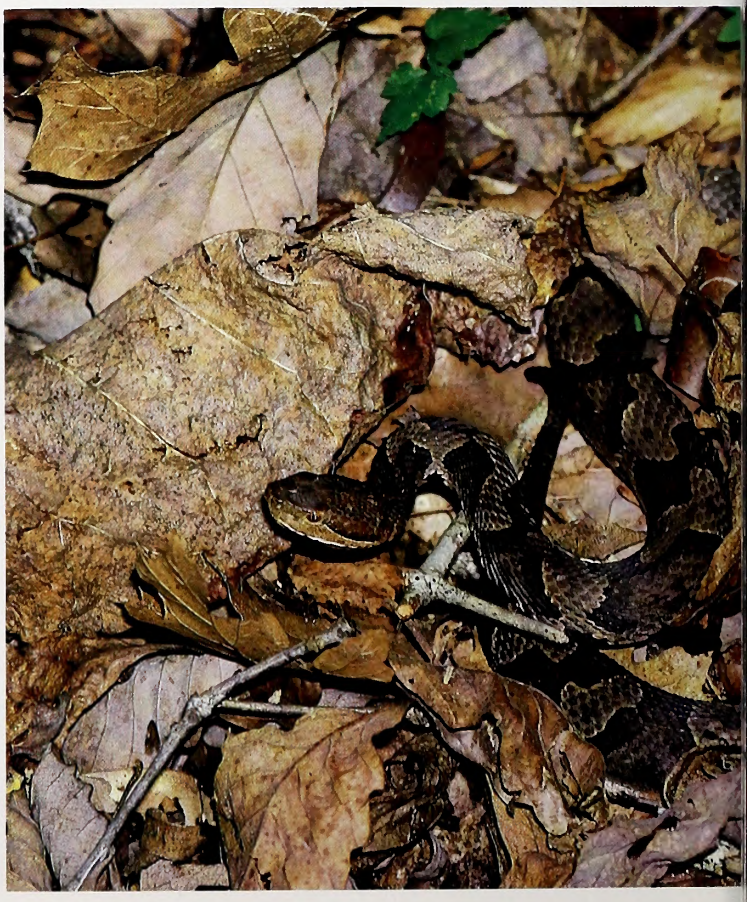
Each of these creatures possesses certain physical and behavioral adaptations that help it survive in the wild. Many animals have developed fearsome weapons of defense, while others have found that the best means of staying alive is to escape attention. How? Through concealment and camouflage.

Because of war and its dangers, man has devised numerous methods of camouflage in military activity. But ages before anyone had ever dreamed of camouflaging soldiers' helmets, battleships and ammunition dumps, nature had already invented and perfected natural camouflage. The creature that lived longest was the one hardest to see.

A cryptically colored animal has a twofold advantage: it can approach within closer striking distance of its prey and can also be overlooked by its own enemies. Over eons of time, creatures that had developed patterns of concealing coloration escaped their enemies and survived in



Colorful false *eyespots make these insects look dangerous, but the three are really sheep in wolves' clothing. The false eyespots on the eyed elater beetle (above, left) frighten predators as do the owl-like eyespots on the wings of the male io moth (above, right). Large and colorful eyespots help the larva of the tiger swallowtail butterfly (below) deceive would-be predators.*

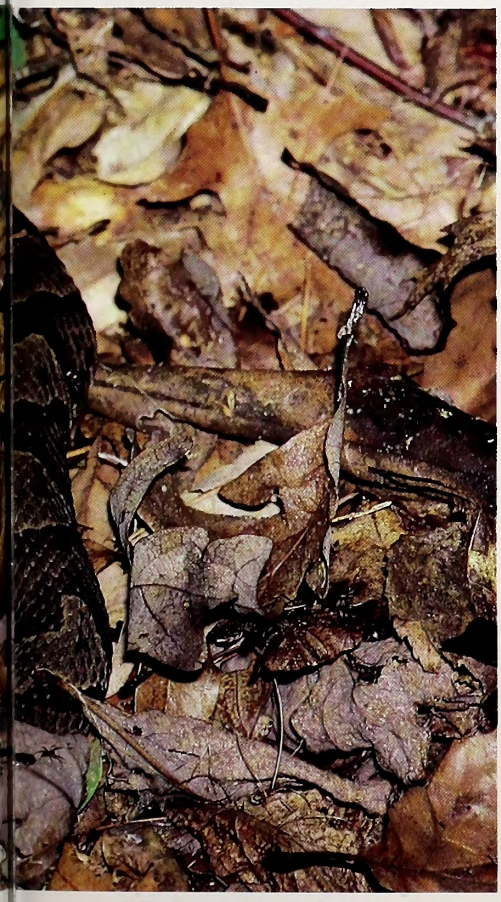


The cottontail *rabbit uses natural camouflage to conceal its nest under vines, leaves and vegetation. The markings of the copperhead (right) make it difficult to see among fallen leaves. Body coloration helps some creatures blend into their accustomed surroundings. The lichen-like markings of the spider* Aranea angulata *(above), for example, mimic the lichen-covered rocks where the spider dwells.*

greater numbers than their less camouflaged kindred, and they passed on these changes to succeeding generations.

The scientific study of the survival value of protective coloration and mimicry began in the 19th century, when naturalists like Bates, Muller and Wallace explored the vast rain forests of South America and formulated theories on animal coloration that became the foundation for much of the later research on the subject. For 11 years, Henry Walter Bates buried himself in the dense jungles along the Amazon River, developing his ideas on protective resemblance and mimicry in insects. His book, *The Naturalist on the Amazon*, published in 1863, has long been a classic in the literature of natural history and exploration.

In more recent times, experiments by careful research scientists have proven the survival value of both camouflage and mimicry beyond the shadow of doubt. It has been demonstrated that even in the semi-darkness of night, an animal that contrasts with its background is far easier for a predator to capture than one that conforms to its surroundings. It is true that many creatures do not perceive color as we do. In fact, except for the primates, none of the mammals show any sense of color recognition, except for differences in brightness, though, as far as we can tell, birds, fish and insects have good color vision.



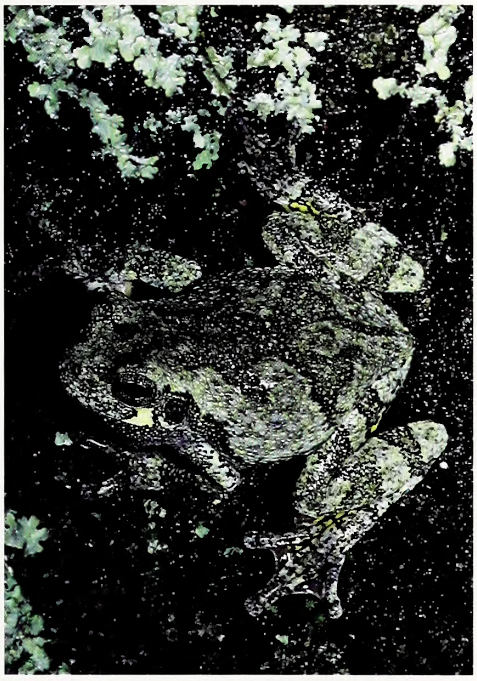
Though the concept of protective coloration and mimicry rests on a solid foundation, it is such an alluring subject that it can sometimes lead to nonsense. An overactive imagination may read into a case a reality that does not exist. For example, one early naturalist declared that flamingos were colored pink to protect them when flying against the sunrise or the sunset. We can but wonder how the poor creatures are protected the other 98 percent of the time when not flying against the sunrise or the sunset. Another imaginative observer believed that certain insects had evolved a resemblance to rusty nails!

To be successful, camouflage and disguise must be supplemented by appropriate patterns of behavior. The concealed creature must remain "frozen" in immobility, as any movement would destroy even the most perfect example of camouflage. It must also have inherited habits that keep it in an environment matching its coloration. A bright green insect on a red flower would attract the attention of every predator. Instead, insects, and many other animals as well, show an amazing tendency to occupy environments similar to their coloration. Green insects normally remain among green vegetation even when not feeding. Light-colored moths seek out light-colored resting areas, and dark-colored ones seek dark areas. Certainly, this involves some kind of choice on the part of the insects. How such a complex combination of coloration and behavior patterns came about no one knows. It is a mystery that causes one to shake his head and smile.

In every region of the earth we find spectacular examples of protective coloration. Polar bears, snowy owls and several other inhabitants of subpolar regions are always white, enabling them to stalk their prey more easily among the ice floes and eternal snows. A little farther south, where the snows are heavy in winter but melt in summer, a number of animals, such as the northern weasel, the snowshoe hare and the ptarmigan, undergo seasonal changes from white coats that match the winter snow to brown ones in spring, after the snow has melted and the ground is bare again.

In our own woodlands, the spotted coat of a white-tailed fawn lying on the forest floor blends so well with the spots of sun and shadow that, to most eyes, it is nearly invisible. And the mottled brown-and-buff plumage of the ground-nesting whippoorwill so closely resembles the dead leaves of the sun-dappled woodland that it is almost never seen until it explodes like a bomb from under your feet or puts on a "crippled wing" act to lure you away from its nest.

Certain snakes, frogs and salamanders are



Protective coloration *helps the gray tree frog almost disappear against the lichen-covered tree. Natural camouflage like this develops over eons of time.*

The insect *world abounds with examples of natural mimicry. By imitating twigs, sticks or other natural objects, such creatures have a selective advantage in the struggle for survival. The walkingstick's resemblance to a twig (left) helps it avoid detection from predators. A hairy robber fly, here preying on a honey bee (below), mimics a bumblebee while the treehopper (bottom) looks like the thorns that it lives among.*

very protectively colored. The copperhead, with its reddish-brown hourglass pattern, just seems to melt into its background; and it is almost impossible to spot a rough green snake among the green leaves. The coloration and pattern on the body of the gray tree frog (*Hyla versicolor*) conforms almost perfectly to the lichens on the tree trunks where it is found. Also, the wood frog (*Rana sylvatica*) benefits by its light-brown coloration, which matches the fallen leaves of its woodland habitat. The green salamander (*Aneides aeneus*), an Appalachian cliff-dweller, has evolved a lichen-like pattern that closely approximates the lichen growths on the rock surfaces it lives among. Though largely nocturnal, these salamanders are often seen running over the cliffs on dark rainy days.

A number of spiders have become masters of deception and camouflage. The crab spider (*Misumena vatia*) does not use a web to ensnare its prey but conceals itself in ambush inside a flower head and patiently waits until an insect visitor comes along. In the course of a few days it can change its color from white to yellow, and vice versa, to match the color of the flower on which it has taken up residence.

It is in the world of insects that the trickery of concealment has been carried to extreme and fantastic lengths. This deception often goes beyond the matching of a background and alters an insect's shape to make it look like some inedible object in the environment—a twig, leaf, thorn, lichen or piece of bark. All around us there are hundreds of examples, of which I will mention only a few.

There are walkingstick insects that you can hardly distinguish from the twigs among which they live, each looking just like a broken twig with six slender legs. The cryptically colored geometrid moth (family *Geometridae*) rests on tree bark during the day, where only a practiced eye can detect it. Its larva, called a "looper," is noted for its resemblance to a twig, which it mimics with perfection down to the smallest detail, with a head that looks like a little terminal bud. When threatened, it stiffens its body and, with a single pair of prolegs, holds on to its perch at exactly the same angle as the twig it imitates. The locust treehopper (*Thelia bimaculata*), with a thornlike spike adorning its body, lives among the thorns of locust trees, where it is often overlooked by hungry birds.

One of the most perfect examples of concealing coloration that I have ever seen was a white ambush bug among the florets of Queen Anne's lace. Only when it moved could it be clearly seen. Some types of katydids and grasshoppers blend superbly with their environment. The rock-loving grasshopper (*Trimertropis saxatilis*), with its mottled shades of gray and green, resembles so closely the lichens on the cliffs where it lives that it is almost invisible among them.

Many harmless creatures gain protection by developing colors and patterns that mimic noxious or dangerous species. For example, several kinds of flies and moths fool their enemies by masquerading as stinging bees and wasps. A notable case of mimicry is that of the viceroy butterfly and its "model," the monarch. The monarch caterpillar feeds on milkweed leaves, retains the plant's poisons and distasteful properties within its system, and passes them on through the pupal stage to the adult butterfly. Birds learn to leave all monarchs strictly alone, recognizing them by their brilliant warning coloration. Another butterfly, the viceroy, has developed a color pattern so closely matching the bright robes of the monarch that although it is perfectly edible, it is generally unmolested. Scientific experiments suggest that this kind of resemblance—known as "Batesian" mimicry — has played a vital role in the survival of many species.

Some harmless insects deceive their enemies by simply *looking* dangerous. The large false "eyes" on the hind wings of the io moth and the polyphemus moth, when suddenly flashed in the face of a potential predator, seem to say "I am an owl." The two very realistic eyespots on the thorax of the tiger swallowtail caterpillar suggest the wildly staring eyes of a snake. The large, hideous-looking caterpillar of the regal or royal walnut moth (*Citheronia regalis*) has several pairs of fearsome, black-tipped orange spines on its body and, though it is completely harmless, is known as the hickory horned devil. All these are "sheep in wolves' clothing" that trick their enemies by masterfully playing a game of bluff. To further heighten the effects of their bluffing game, certain sphinx moth caterpillars, when approached, will raise the foreparts of their bodies in a threatening stance, aggressively swaying backward and forward as if they fully realize the kind of game they are playing, which, of course, they do not.

In a certain sense, insects that deceive their enemies by act as well as appearance are the most baffling of all creatures. These patterns of coloration and corresponding instinctive behavior were developed over countless generations, building change upon minute change until the present state of accomplishment was reached. A thousand stories might be told of these strange lives and their ingenious struggles to survive—true tales that are more incredible by far than anything a novelist could invent. ⊠

Another twig mimic, *the geometrid caterpillar, holds onto its perch at an angle that mimics a twig. Its head even looks like a terminal bud.*

N.C. MARSH Habitat Will Benefit

Billfish Tourney Makes Big Bucks for Ducks

Written and Edited by Vic Venters

Want to do something that helps waterfowl? Go marlin fishing. The connection is not as unlikely as it seems. Last August, Ducks Unlimited sponsored its first "Band the Billfish" Tournament and raised $38,500 to be used for wetlands conservation projects. On August 9-12, the second annual tournament will be held at Atlantic Beach, and Ducks Unlimited is anticipating another big success.

"As a result of last summer's first tournament, a total of $57,750 will be contributed to wetlands projects, including matching North Carolina state funds of $19,250. Of this, $38,500 will be spent conserving wetlands in North Carolina as part of the MARSH (Matching Aid to Restore State Habitat) project," said tournament chairman Lloyd Goode Jr. "The remaining $19,250 has been forwarded to national Ducks Unlimited to support wetlands projects elsewhere in the United States, Canada and Mexico.

"We're excited about last year's success, and the tournament has lots of potential to continue to provide needed funds to help restore our waterfowl heritage," said Goode. This year's tournament will be headquartered at the Sheraton Atlantic Beach, with the fishing and weigh-in center at the Seawater Marina on the Atlantic Beach Causeway. The basic signup fee for each boat entered is $600; however, boats can also sign up for bigger prizes in Level 2 for an entry fee of $900. Those who sign up in either category by July 26 will also be eligible for special "early bird" prizes. Entries can be made through Mark Shouse, P.O. Box 1333, Morehead City, N.C. 28557.

"Tagging billfish is equivalent to banding waterfowl," said Goode. "That's why we call it 'Band the Billfish.' We tagged and released 20 billfish and tuna last year. The only billfish that wasn't released was a 1,002-pound blue marlin that was caught too late to be eligible. That was the first marlin over 1,000 pounds ever brought into a Carteret County port, and only the 20th ever caught in the North Atlantic."

Three MARSH projects have already been completed in North Carolina by the N.C. Wildlife Resources Commission and N.C. Ducks Unlimited, and 15 more are being evaluated for possible funding. In addition to raising money to help such waterfowl conservation projects, the tourney also encourages research and conservation of ocean fishes.

Major donors are also being encouraged, and two DU projects at Hunting Creek Swamp in Davie County and Gulf shore flowage in Nova Scotia will be funded through major donations to the tournament. Qualifying contributors will have their names placed on a permanent plaque and cairn, with a dedication ceremony hosted by Ducks Unlimited.

—*Jim Dean*

Will Feature Shooting, Safety Courses

Public Firing Range Planned

As North Carolina's urban centers continue to expand, it's becoming harder and harder every year for shooters to find safe places to practice their sport. However, Wake County, one of the state's fastest-growing counties, has taken steps to preserve our nation's shooting heritage by planning to build one of the state's first fully public shooting complexes.

As planned by Wake County's Division of Parks and Recreation, the complex will offer a 100-point shooting range and five skeet and trap ranges. "They will conform to international standards so we can hopefully hold some Olympic festivals there," said David E. Carter, director of Wake County's Parks and Recreation Division. Also planned are a classroom facility where shooting classes will be conducted, as well as hunting safety and ethics courses. The department is working with the Boy Scouts to develop a hunting safety course. "To my knowledge, this will be the first public firing range in the state of North Carolina," Carter explained. The range is planned to be located north of Holly Springs off the Old Holly Springs-Apex road and should be open next fall, he added.

Previously, Wake County's Parks and Recreation Division has received national, state, and local awards for other projects it administers, such as its park at Raleigh's Lake Crabtree.

Tree Finds Home Overseas

Tulip "Poplar" in England

Dear Editors:

I am indebted to Jim Rouse of Pilot Knob for sending me Doug Elliott's article on the tulip poplar, which appeared in the April 1989 issue of your splendid magazine. Jim knows of my interest in this well-travelled member of the magnolia family. As a tourist guide for the beautiful, medieval English town of Shrewsbury, I derive particular pleasure from pointing out to visitors from North America the specimens of *Liriodendron tulipfera* to be seen in our town. Its popularity is such that it is one of 20 trees which Shrewsbury (winner of the Britain in Bloom 1988 award and second place in Europe in Bloom 1988 award) will allow to be planted within the borough's parks and gardens.

Specimens have been documented here for more than 200 years. Indeed, Lord Robert Clive (Clive of India) in the 1760s records in his diary as "writing my diary sitting in the shade of a tulip tree." The tulip trees in England — unlike the straight-growing "poplar" in North Carolina — have a markedly spreading characteristic which may have puzzled some of your readers when Doug Elliott described it as a "favorite shade tree."

—*Robert Jameson*
Shrewsbury, England

Habitat Work, Enforcement and Hunter Safety Hailed

Conservation Groups Honor Wildlife Commission Employees

Four Wildlife Commission employees were honored this spring with awards from two North Carolina conservation groups. Three received Governor's Awards from the North Carolina Wildlife Federation while one received a professional award from the state chapter of the National Wild Turkey Federation.

Wildlife biologist Terry Sharpe of Hamlet was named Wildlife Conservationist of the Year, wildlife enforcement officer Sgt. David Stokes of Grandy was named Wildlife Officer of the Year, and Capt. Wilton Pate of Ayden was given the Governor's Award for Hunter Safety Education.

Sharpe joined the Wildlife Commission in 1976 and has worked as both a district wildlife biologist and small-game project leader. He has developed a special interest in small-game management and fire ecology while directing management activities on the Commission's 63,000-acre Sandhills Game Land. Sharpe has also helped develop demonstration areas in a cooperative program between the Wildlife Commission, the N.C. Wildlife Federation and the N.C. Agricultural Extension Service. He's also active in Quail Unlimited.

Sgt. Stokes, an enforcement officer since 1982, supervises three officers in Currituck and Dare counties. Prior to his promotion, Stokes was stationed in Cabarrus County, where he provided programs about wildlife appreciation. He's also worked to produce a 30-minute television program on boating safety.

Capt. Pate began his career in enforcement in 1960. He was promoted to captain in 1986 and became statewide coordinator for the Commission's hunting and boating education programs. Capt. Pate was a leader in designing and implementing the state's Hunter Safety Education Program that has been in place since 1972. Pate is a member of the Law Enforcement Section of the Southeastern Association of Fish and Wildlife Agencies and is a certified rifle, pistol, shotgun and bowhunter instructor.

In a separate ceremony, wildlife management technician David Allen of Topton won the professional award from the North Carolina chapter of the National Wild Turkey Federation. At the chapter's annual banquet, Allen was presented the award for his work in improving wild turkey habitat. Allen is a crew leader for the Commission and is noted for being an expert turkey live-trapper. "People call me all kinds of things but I guess that's one thing I'm noted for," said Allen.

— Angela Dorman Hill

MELISSA McGAW

Federation Awards: *Three Wildlife Resources Commission employees recently received awards from the North Carolina Wildlife Federation. Pictured above from left to right are Terry Sharpe, recipient of the Wildlife Conservationist of the Year Award; Capt. Wilton Pate, recipient of the Governor's Award for Hunter Safety Education; and Sgt. David Stokes, Wildlife Officer of the Year. Not pictured is David Allen, the Commission's wildlife technician, who won a professional award presented by the North Carolina chapter of the National Turkey Federation for habitat improvement.*

Camp for Conservation

Fur, Fish 'n Game Camps Offered This Summer

Although most camping trips are still a month or so away, you may want to consider sending your kid to Fur, Fish 'n Game camps and 4-H shooting sports weekends sponsored each summer. The camps are open to any youth between the ages of 11 and 15 and will be held July 8 through 13 at Camp Millstone near Ellerbe, North Carolina. Classes cover topics such as ecology, aquatic biology, trees and forestry, wildlife photography, first aid and more. There's also plenty of time to pursue outdoor activities like swimming, hiking and canoeing. Classes are professionally taught. The cost of the camp is $110, and child does not have to be a 4-H member to attend.

A shooting sports weekend will also be sponsored at Camp Millstone the weekend of June 29 through July 1. This is an opportunity for children and their parents to learn explore programs in rifles, shotguns, black powder and archery. The cost of this weekend will be $45 per person.

The Fur, Fish 'n Game camps and shooting sports weekend are cooperative efforts between the North Carolina Agricultural Extension Service, the N.C. Wildlife Resources Commission, the North Carolina Wildlife Federation, the North American Hunters Association, the Wake County Wildlife Club, the National Rifle Association and the North Carolina Gun Collectors Association.

For more information on either of these camps, please contact your county 4-H agent or call Extension Forest Resources in Raleigh at (919) 737-3386.

KEN TAYLOR

Conservation Campers: *Fur, Fish 'n Game camps offer youngsters a chance to learn about conservation activities and have a good time while they're at it. This year's camp will take place in July at Camp Millstone near Ellerbe.*

Cooking Kills Trematodes

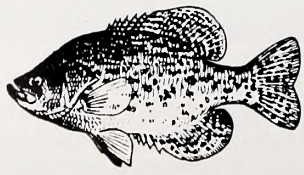
Fish with Parasites Ugly but Edible

If you've been fishing long, chances are you've probably caught bass or sunfish with small black spots in their skin or fins, or slightly larger, cream-colored cysts in the flesh. Yes, they're ugly, but the good news is these fish are safe to eat when cooked.

The grubs are the larval stage of parasitic flukes called trematodes. The adult fluke lives in the mouth or throat of fish-eating birds like herons. Eggs are shed in the water, and after hatching, the larvae enter snails. After leaving the snails, they penetrate the skin of a fish and form the cyst of a grub that you see. When the infected fish is eaten by a bird, the grub develops into its mature form.

However, these parasites are harmless to people, and all fish parasites are killed by normal cooking methods. The fish can be prepared, cooked and eaten normally because the grubs are not noticeable after cooking. You may wish to cut the grubs out for aesthetic reasons, but you do not need to throw the fish away.

Courtesy of the Wildlife Resources Newsletter of the Department of Extension Forestry and the Department of Zoology at N.C. State University.



Watch Stringer at Ottie's Pond

Readers Catch Fish, Otters Get Dinner

My father has recently moved back to North Carolina and one of the big reasons for his doing so was to go fishing with his boys.

One of the ponds we fish is called Ottie's Pond because there is a family of otters living at it. Late one afternoon, we were fishing there and had seven nice bass on our stringer. I talked Dad into going to the other side of the pond to fish and the entire time we were over there two otters were swimming and playing within sight of our bobbers.

After watching them for a while, we decided to pack up and go. When we went back to the other side of the lake to get our stringer, we found only the stringer and no fish! "Oh well," Dad said. "We got smarted out of our dinner but we had an interesting fishing trip anyway." I love fishing in North Carolina.

—John Godwin III
Garner, N.C.

Calendar

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before traveling to an event. Listings for calendar should be sent at least four months in advance.

May 4-6
The Outdoor Bowhunter Shoot at Charlotte's Mecklenburg Wildlife Club will feature a target-shooting competition that simulates bowhunting conditions. For more information, contact Jesse Smith, Mecklenburg Bowhunters, 7630 Holly Ct., Charlotte, N.C. 28227

Most Fish Can Be Caught Again

Catch-and-Release Tips For Blues

For many years, fishermen have considered our oceans to be bottomless treasure pits with a never-ending supply of fish. But with the stocks of some popular gamefish like mackerel and grouper sliding, perhaps it's time to rethink that theory.

Bluefish are one species that you'll occasionally see some anglers overharvesting. Bluefish don't freeze especially well and are better fresh, so once you catch as many as you need for a few dinners, try releasing a few of these magnificent gamefish. The N.C. Beach Buggy Association and coastal fishing guide Joe Malat offer the following tips for putting the blues back in the blue.

"Replace the standard treble hook with a single large hook," Malat advises. "One barb is much easier to extract than three. Maybe go one step farther and try bending down the barb on the hook, and it will literally slip out of a blue's mouth when you beach it. You may lose a few on the way in, but the fish can't throw the hook as long as you keep a tight line."

"Try to handle the fish as little as possible, and never pick them up with your fingers in the gills if you plan to release them. Wet your hands to keep from removing the slime that coats the scales," he continues. "This slime acts as a protective coating on the outside of the fish and guards against infections.

"A good pair of pliers helps remove hooks from a wildly thrashing bluefish.. This can be the most difficult and dangerous aspect of releasing big blues and those teeth can inflict a nasty bite," Malat cautions. "Once your fish is on the beach, firm pressure applied on the fleshy shoulders just behind the head and gills will enable you to remove the hook easily. Try to avoid stepping on the fish or putting too much pressure on the body cavity. Damage to its internal organs can result. When returning fish to the water, try to avoid tossing them end over end. They are somewhat stressed anyway, and if you push them gently back into the water heading out to sea, they usually take off like a shot for deeper water."

JOEL ARRINGTON

Catch-and-Release: *Big bluefish like this sometimes aren't as tasty as the smaller blues. Instead of killing all your catch, throw a few back to fight another day.*

Cast Us A Line...

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit. Please send to Letters Dept., *Wildlife In North Carolina*, 512 N. Salisbury Street, Raleigh, N.C., 27604-1188.

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27611.

Status on February 28, 1990

	Numbers Sold	Revenue Received
Lifetime Sportsman's License	48,983	$18,117,360.84
Lifetime Hunting License	630	175,134.14
Lifetime Fishing License	3,776	859,055,20
Lifetime Subscriptions to Wildlife in N.C.	1,884	258,797.71
Contributions	—	169,966.12
Fund Total	55,273	$19,580,314.01
Total Interest Earned	$5,350,708.51	

Better Management, More Birds

Grouse Habitat Workshop Planned

If you're interested in seeing more grouse in North Carolina's mountains, make plans to attend an upcoming ruffed grouse habitat workshop in June. Like other small game, populations of this gamebird can be improved by habitat management.

On June 15, Haywood Technical Institute in Waynesville will host a ruffed grouse workshop for interested landowners and wildlife managers. The workshop will consist of a half day of classes, with the remaining time spent on a field trip to the Harmon Den area on U.S. Forest Service land. A panel of experts will address topics such as grouse biology, wildlife considerations in timber management, managing forest openings and managing private land for grouse.

The workshop is open to any interested party and is being sponsored by the N.C. Wildlife Resources Commission, the Ruffed Grouse Society, the Society of American Foresters and the Agricultural Extension Service. For more information, contact wildlife biologist Terry Sharpe, 317 Hamlet Avenue, Hamlet, N.C. 28345, or call (919) 281-3917.

LEONARD LEE RUE III

Grousing About: *If this young ruffed grouse is to live long enough to breed and reproduce, it'll need the right kind of habitat. Interested landowners and wildlife managers can learn more about how to best manage land for ruffed grouse at a habitat workshop planned for June at Haywood Technical Institute in Waynesville.*

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Catching Some Rays

This rock shelf is a perfect place for this colorful corn snake to absorb the warmth of the rising sun while keeping a watchful eye for predators.

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WILDLIFE IN NORTH CAROLINA

JUNE 1990 75 CENTS

Hot And Cold Bass

by Jim Dean

Some fish are harder to catch than others. Muskellunge enjoy that reputation, and so do wild brown trout. Hefty shellcrackers are by no means easy to find and catch, and a big chain pickerel is a rare prize. Still, you could argue that the largemouth bass is the most frustrating of them all. Blasphemy? Maybe not. Experienced trout fishermen are seldom skunked while experienced bass fishermen frequently wear the white stripe of failure.

JOEL ARRINGTON

Bass have been studied very intensely in recent years, and certainly no species has attracted more angling attention. Even the most highly skilled fishermen strike out occasionally despite the aid of an array of modern tackle, lures, boats and electronic gear unmatched in the annals of angling. Indeed, scanning some of today's tackle catalogs and fishing magazines might cause you to wonder if even the exploration of space has consumed more money or tactical planning. You think landing a man on the moon was tough? Try to catch a decent string of bass on most trips, or even one piddling 10-pound largemouth in a lifetime.

Even so, we've gained some ground. The development of plastic worms in the 1950s has certainly had an impact. More recently, depth-finders have given anglers a window into the watery unknown. At first, many bass fishermen felt depth-finders would be the ultimate weapon, and there was even early pressure to have these devices outlawed as unsporting. Such fears have proven unfounded, however. A depth-finder's biggest advantage is revealing the contours of the bottom beneath you. While it can pinpoint fish, it doesn't tell you precisely what they are. It's still up to the angler to connect the right lure to the bass, and that's not a heck of a lot easier than it ever was.

There's another tool — a much older one — that more and more bass fishermen are learning to trust. It's the thermometer — specifically, a thermometer that can measure water temperature at all depths from top to bottom. Often used in combination with a depth-finder, it helps you determine where bass will be, at what depth, and sometimes even whether they are likely to be feeding.

Some fishing thermometers are permanently installed on bass boats, while others are portable, and several brands are available through tackle stores and mail-order shops. My portable model consists of a sensor on a long wire connected to a battery-powered dial that you can read. It's a bit cumbersome to use, but you can measure the water temperature at the surface and as deep as the wire will reach.

Such thermometers are particularly useful in early spring. Bass don't begin to feed much until the water temperature passes 50 degrees, and many experienced fishermen think the magic mark is somewhere around 57 to 60 degrees. Ponds warm more quickly than lakes, affording good fishing earlier. In larger lakes, lengthening days and sporadic periods of sunny weather begin to warm the surface layer in shallow coves and headwaters. Creeks entering the lake also often carry a slightly warmer current. Bass, especially large females with spawning on their minds, begin to make forays into this warmer water. Without a thermometer to determine the surface temperature of the water, it's a guessing game.

Later in the spring when the water temperature hits 68 to 72 degrees, many bass will be actively spawning, though not all at the same time, and fishing is likely to remain good. Spawning is usually followed by the best fishing of the year until the weather gets really hot, forcing bass into deeper water. For many fishermen, that's when the fishing gets tough. But not if you use your thermometer to help you locate the thermocline, that deeper layer of cool, oxygen-rich water favored by bass in the summer. The thermocline lies between the hot upper layer called the epilimnion, and the cold, oxygen-poor lower layer called the hypolimnion. By using your depth-finder and thermometer to find spots where the thermocline intersects good cover or sharply defined structure, you can locate and catch more bass. Underwater brush, stumps, drop-offs and creek channels within this comfort zone will almost always harbor bass.

When fall arrives, your thermometer is likely to reveal a surprise. While the weather may feel cool to you, the water often remains stratified into layers well into the fall — sometimes into November — and you're often better off fishing summer patterns on deeper structure until after the first hard frost. You'll even find a thermometer useful for winter bass fishing. In some cases, you'll learn the water temperature is nearly the same from top to bottom, varying only a few degrees. This minor difference, however, can make a huge difference in your success.

We'll never figure it all out, of course, and we may not really want to. But if your bass fishing is more often cold than hot, a thermometer will help you catch more and bigger fish.

June 1990
Volume 54, Number 6

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Nature's Ways *by Lawrence S. Earley*

Back Of The Book *by Vic Venters*

Cover *A Cecropia moth hovers amidst apple blossoms in this botanical illustration by Linda Funk. Early botanists were often artists able to make very accurate drawings of newly discovered species. Funk's art follows this historic tradition.*

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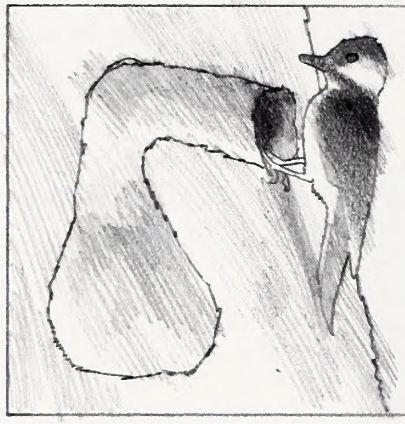
The red-cockaded *woodpecker's entrance tunnel, 2 inches in diameter, is angled slightly upward 5 to 6 inches deep. Then the red-cockaded drills downward, widening the tunnel to a gourd shape.*



	Specialists	Generalists
Reptiles	*queen snake* *rainbow snake* *mud snake*	*box turtle* *snapping turtle* *copperhead*
Amphibians	*tiger salamander* *marble salamander* *spotted salamander*	*bullfrog* *green frog* *American toad*
Mammals	*northern flying squirrel* *Indiana bat* *golden mouse*	*whitetail deer* *black bear* *raccoon*
Birds	*red-cockaded woodpecker* *cerulean warbler* *Bachman's warbler*	*robin* *mallard* *common flicker*
Fish	*rainbow darter* *threadfin shad* *Carolina madtom*	*largemouth bass* *bluegill* *channel catfish*
Insects	*cicada killer* *ichneumon wasp* *Monarch butterfly (caterpillar)*	*giant water bug* *ground beetle* *Monarch butterfly*

A specialist species *like the red-cockaded woodpecker makes non-negotiable demands on its habitat. It builds its nest cavities in live, mature (75 years old or older) longleaf and loblolly pine trees in open canopy. Because its habitat has declined, the red-cockaded is an endangered species today.*

The felling of *the upland forests in the Midwest doomed the passenger pigeon, a specialist that depended upon these forests for food and habitat. The bird was also highly gregarious, and when its population began to fall it was not able to survive.*

The raccoon is *one of the most adaptable of mammals, able to eat a wide variety of foods, including foods from garbage pails and landfills. Like other generalists, it has learned to live with man to the extent that it is one of the most common mammals in suburban areas.*

Generalists and Specialists

written by Lawrence S. Earley/illustrated by David Williams

Adapt or perish: This seems to be the normal law of species, either plant or animal. Yet in nature we're confronted not only with highly adaptable species, sometimes called generalists, but also with those that are not very adaptable at all. We call them specialists.

One naturalist has called generalist species "jacks-of-all-trades," or species that can adapt to a fairly wide range of habitats, foods and conditions. Among them is the white-tailed deer. After they were nearly exterminated by the end of the 19th century, deer rebounded strongly and today are as likely to be found in the Coastal Plain as in the mountains, their success due mainly to their adaptability. The black bear is another generalist species, and so are such common mammals as raccoons and opossums.

Unlike the generalists, specialists seem to load the deck against themselves by choosing the narrow path rather than the broad boulevard of generalism. Salamanders, for example, are almost always specialists, says Alvin Braswell, curator of lower vertebrates at the Museum of Natural History in Raleigh. Tiger salamanders must breed in ponds that are fishless or else their larvae will be eaten. The marbled salamander can live in a variety of terrestrial habitats, but it lays its eggs only in pools that dry up in the fall and flood in winter (traits that make it both a generalist and a specialist).

Another specialist is the queen snake. This snake is fairly widely distributed — it inhabits both the mountains and the Piedmont — but it eats only soft-shelled crayfish. A specialist waterfowl species is the red-headed duck, which feeds in marshes and along shorelines in winter, a habit that makes it vulnerable to hunting. By contrast, an adaptable waterfowl species like the mallard can eat at night and exploits stubble fields for corn.

As might be imagined, the specialist's habit to exploit a very specific habitat can make it vulnerable to changes in that habitat. The red-cockaded woodpecker, for example, builds its nesting cavities primarily in old-growth (75 years plus) longleaf pines. Once longleaf pine trees covered millions of acres of southeast North America, but today there are only a few remnant stands of old-growth longleaf. As a result, this woodpecker is today an endangered species. Similarly, the bog turtle is restricted to mountain wetland habitats, which were once more abundant but today have been mostly drained for development. The turtle, too, is rare throughout its narrow range.

Some species have already become extinct, mainly because their habitats changed and they couldn't adapt. The passenger pigeon once blackened the skies above North America. Market hunters who thought the population was inexhaustible took a dreadful toll, but the bird's final knell was rung when the beech and oak forests it depended on for its food were felled back in the 19th century. There are no passenger pigeons today.

Is it better to be a generalist than a specialist? It depends. When environments tend to be constant, specialists have an advantage. The species that is able to exploit a hard-to-get food or a narrow habitat will have fewer competitors than the generalist, and that's an edge in the struggle for survival. But when environments are rapidly changing, the adaptable generalist is usually better off than the unadaptable specialist.

So Many Sunfish

Not all the species of "bream" are as well known as bluegills. Here are some others common to North Carolina's waters, along with tips on how to catch them.

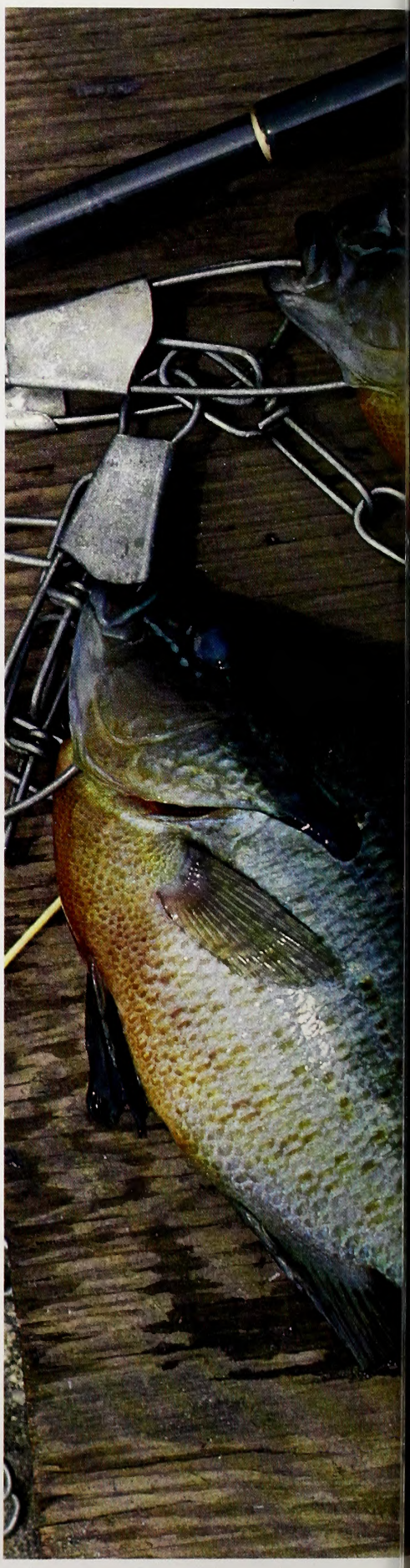
written and photographed
by Eugene Hester

Sunfish have fascinated me since I was a boy, and I have fond memories of fishing for them near home with my father and brother William.

As a country doctor, my dad had an unpredictable daily schedule, but he often found time on summer afternoons to take us to Tarpley's Millpond or Lake Myra for a couple of hours of fishing after supper. While Dad fished for bass, I would try for sunfish with a stubby 5-foot homemade reed pole. Using earthworms dug from our garden, I would drop my baited hook near stumps and logs. My technique often resulted in fishing almost under the boat, but it worked nicely. On some days I was the only one to bring home a fish.

On other trips, William and I would go to one of the nearby creeks. At Buffalo Creek, I fished for sunfish with that stubby little pole by dangling the bait among submerged tree roots or between logs near the river bank. I sometimes pulled amazing numbers of sunfish from a single spot in this slow-moving stream. When I caught a very small fish, William would use it as bait for a hungry chain pickerel.

On other days, we went to the Little River, where we fished among granite boulders in the faster current. Sometimes we found large numbers of sunfish and had fantastic fishing trips, outings still memorable today, a half-century later. The river fishing for sunfish was outstanding in the spring and we would sometimes spend an entire day there on a Saturday or the first day of summer vacation.



***A flyrod** is one of the best and most graceful tools for catching sunfish on ponds and lakes (left). It's also effective on streams for colorful redbreast sunfish or robins (right), especially during spawning when most sunfish species defend their nests with vigor.*

Early on, I recognized that there were different types of sunfish. I also noticed that we would find different species in different places. Those found among stumps in a millpond were different from those found in a moving river current.

I also learned that some baits worked best for some species of sunfish while different baits worked better for others. Earthworms, crickets and grasshoppers were our favorites for pond fishing, but we found small crawfish or the tails of larger ones best for river fish.

Catching these natural baits became an essential part of preparing for our fishing trips. William and I had favorite places around the garden to find earthworms. A nearby weed field yielded the grasshoppers and crickets, and marshy wet spots in two cow pastures provided inch-long crawfish the perfect size for bait.

Over the years, I have learned more about the different species that make up the diverse sunfish family. While they are all closely related and have some characteristics in common, they are also different in appearance, and each has its own preferences for foods and habitat. They spawn at different times and places, too.

There are dozens of members in the sunfish family, with at least 24 species found in North Carolina. Largemouth and smallmouth bass belong to this family, as do crappies. There are also some miniature species, including the blackbanded and pigmy sunfishes, that grow to only an inch or two in length, even as adults.

The bluegill, redear, redbreast, warmouth and pumpkinseed are some of our better-known and more popular sunfish. Collectively, they are all often called bream in the Southeast, or simply sunfish or panfish. They grow large enough to have sporting qualities and are widely distributed across the state.

Bluegills are the best known and most popular of this group. They are so widely distributed and feed on such a variety of foods that for many anglers the ubiquitous bluegill was probably the first fish they ever caught. They are common in ponds and lakes as well as in slow-moving warmwater streams. Under favorable conditions, they grow to a respectable size and are beautiful fish, especially in summer when they take on their full breeding colors.

If I could design a fish, it probably would turn out to be something like a bluegill. I would want it bold enough to take natural bait and artificial lures with enthusiasm, elusive enough to be a challenge, prolific enough so that I wouldn't have to worry about depleting its population, large and scrappy enough to put up a good fight and tasty enough to make a great meal. Those are characteristics of the bluegill, and maybe that's why it's high on the fisherman's list of favorites.

In the warmer six months of the year, bluegills are active throughout the day. Often they will be feeding near the surface at dawn or dusk and will even feed on top throughout the daylight hours on cloudy days. When the sun is bright, however, they tend to avoid the surface and prefer feeding near the bottom.

Bluegills can be caught in a great variety of ways, but William and I have three basic techniques. The original and simplest method is with a cane pole and natural bait. Crickets, grasshoppers and earthworms are still our favorites, but today we usually buy them at the corner bait shop rather than catch our own. These natural baits, when combined with a light cane pole, monofilament line, some split shot, a small red cork and a size 10 hook, provide a simple, inexpensive, but very effective, way of catching a lot of bluegills.

By moving along the shoreline or the edge of weedbeds and dropping a worm or cricket among logs, stumps or openings in weedbeds, it is easy to find bluegills. In fact, their swirls and feeding activity on the surface will often help you find them.

Bluegills spawn at intervals throughout the summer, starting in May. They congregate by the dozens or even hundreds in "nesting" areas and provide some fantastic fishing.

Another method for taking bluegills is to use ultralight spinning tackle. Our favorite lures are the No. 0 Mepps spinner and the 1-inch plastic ripple-tail grub. These are difficult to fish in weedy areas, but when we find open water near cover they are effective and fun to use.

Using a flyrod is one of the most exciting and effective ways to catch bluegills. When outfitted with a floating fly line and popping bug, it is possible to put the bug directly over swirls and other fish activity, yet reach out far enough from the boat so that we don't spook the fish, even in shallow water.

Seeing and hearing a big bluegill take a popping bug from the surface is the kind of thrill that makes bluegill fishing so exciting.

The redear sunfish, also known as a shellcracker, is often the big brother of the sunfish family. In many ponds and lakes, it reaches a larger average size than the bluegill, perhaps because it's harder to catch unless you know how.

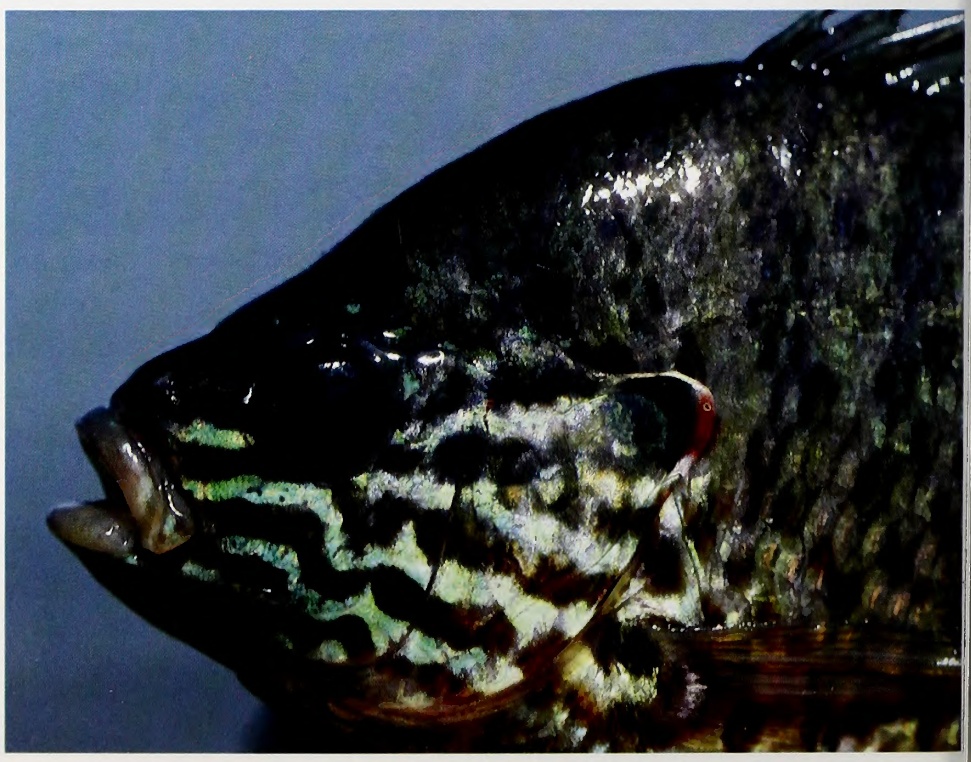
These fish get their nickname because aquatic snails are one of their major foods. They eat the snails by crushing their shells with muscular pads in their throats. They have a small red or pale orange margin around the edge of their ear (opercular) flap. This lighter border helps distinguish them from bluegills and some of the other closely related species.

Probably because of their food preference, shellcrackers like to feed on or near the bottom, so it is necessary to fish deep to catch

***The bluegill**, or "bream," is one of the most common sunfish species found in the state. This one fell for a popping bug — other effective flyrod lures are rubber spiders and sinking ants. Bluegills are common in slow-moving rivers and streams, but do especially well in small ponds and lakes.*

***Redear sunfish** (below) are also known as shellcrackers because of their appetite for snails and other aquatic crustaceans. The best tactic for shellcrackers is to fish live bait or flies near the bottom, as this species does not take surface lures readily.*

Warmouths, *or goggle-eyes, as they are sometimes called, are one of the most voracious sunfish species found in North Carolina. They can also be counted on to bite when the weather turns hot, and they'll often attack lures as big as themselves.*



***The pumpkinseed** is perhaps the most colorful of all the sunfish. Although smaller than some sunfish species, pumpkinseeds can provide excellent early-season fishing because their spawning activity peaks before that of bluegills.*

them. They rarely come to the surface to feed and thus it is possible to miss catching them by using the wrong technique.

We have found, too, that shellcrackers tend to be clustered. That is, there may be a lot of them in one spot, making it hard to find them, but rewarding when we do. After catching one, it is especially important to try again in the exact spot. William and I sometimes catch dozens from under a single log.

Crickets and earthworms fished on the bottom are especially good for catching shellcrackers. Sinking artificial flies used with a flyrod also work well, but because the fish are often among such thick weeds and logs, it is difficult to keep the hook from hanging up on the vegetation.

Sometimes we find shellcrackers while fishing with natural bait for bluegills. But unless we are fishing deep near thick vegetation, we usually miss them. Where shellcrackers are abundant, it pays to fish for them by specifically concentrating on the depth, baits and locations they prefer.

One of our favorite sunfish is the redbreast sunfish, which we call a river robin because the male of this river species has a red breast, especially during the spring and summer breeding season. Their long ear flap also helps distinguish them from other sunfish.

They are found statewide and are especially adapted to living in moving water. We've caught them in streams statewide, from the foothill creeks to the Chowan River. They congregate in river holes among large rocks, logs or beneath undercut river banks.

In spring, they leave these spots and move upstream on their pre-spawning run. These movements are often triggered by rainfall and rising water. Their upstream movements are usually blocked by any river dams, and they congregate below the dams for a few days before moving back downstream.

The deep-water holes below these millpond dams are excellent places to find good concentrations of these fish. Our favorite technique is to drop a small crawfish bait between river boulders. In a moving river current, we also like to drop the bait into the water several feet upstream from a boulder and let the current wash it against the rock. Usually there are hiding places at the base of the rock and if we can maneuver the bait into these spaces, we can catch a lot of robins.

These fish prefer certain spots in the river and those spots are productive for us year after year.

When we can't find small crawfish for bait, we use the tail of a large one and cut three or four small baits from it. At other times we use small pieces of raw shrimp or live crickets. Crappie jigs, 1/16-ounce Panther Martins and No. 1 Mepps spinners work well, too.

When these river robins start their spawning in May or June, they are aggressive and will readily take lures. In large rivers where we have room to cast popping bugs, fishing with a flyrod can be outstanding. Robins strike and fight with an aggressiveness that seems out of proportion to their size.

Warmouths are another fish I caught as a youngster from among tree roots in sluggish water. Also called "chub-robins" or "goggle-eyes," these names, I suspect, came about because of their large, bass-like mouth and body resemblance to river robins and their large and somewhat bulging eyes.

We find warmouths in shallow water among stumps, logs and weeds. They feed on crawfish, minnows and insects and other bait dropped between logs or in little openings in weedbeds. Usually they are solitary and we find only one per spot.

Fishing your bait 2 to 4 feet deep usually works well. When the weather is warm, warmouths will also come to the surface. With that big mouth, they can swallow a larger lure intended for bass. They strike with vigor but their fight is brief, as they usually give up easily.

Warmouths grow to a respectable size, and the larger ones tend to have potbellies. They usually have a brassy coloration, but this varies from location to location. They sometimes have greenish markings, and in other waters, especially the clear or dark coastal waters, they may be almost black.

In early spring, a sunfish to seek is the pumpkinseed. It spawns early, usually beginning in April. These sunfish usually nest in very shallow water, often only a few inches deep. Because the water is so shallow, they create a lot of noticeable surface disturbance by their nesting activities. Their spring activity seems to reach a peak a month or so before that of bluegills and some of the other sunfish.

They will take popping bugs, but because these fish are often small, many bugs will be too large for them. If you are missing them on your flyrod, change to a smaller bug, perhaps a size 12 or smaller. Red wiggler worms are a surefire bait for these colorful little sunfish. Look for pumpkinseeds in clear water with plenty of aquatic weeds. Often, you'll find them in washtub size openings in the weeds.

Pumpkinseeds look similar to redear sunfish since both species have a reddish margin on their earflaps. The pumpkinseeds, however, have bright blue and wavy face lines across their gillcovers and cheeks, and small brown freckle spots on their sides.

Sunfish of any of these species are a worthy challenge to an angler of any age. William and I enjoy going after them as much today as we did decades ago, and some of our favorite spots back then are still our favorites today.

You might just see us on a creekbank or millpond next Saturday. ⊠

Lion in a Pit

...and you laughed at "Tremors." Fortunately ant lions don't grow that big, but how they live and hunt is no less fascinating.

written and photographed by Harry Ellis

From time to time, almost every outdoor stroller has discovered numbers of little funnel-shaped pits in sand or in loose, dry soil. Generally up to 3 inches in diameter and 2 inches deep, they may look harmless, but these pits are in actuality traps employed by insects less than a third of an inch long but armed with a set of powerful jaws and an insatiable appetite. Concealed at the bottom of their pitfalls, these little insects wait patiently for an ant to blunder in. Then they rush out and kill it. They are called ant lions, or sometimes "doodlebugs" by children.

Ant lions, belonging to the nerve-winged order of insects (*Neuroptera*), are found in many parts of the world, including most of North America and throughout North Carolina, often in great numbers. Sometimes the ground is literally pockmarked with their craters, especially under the overhang of a cliff or along a sheltered roadbank. There are several different species, all similar in appearance and habits.

The adults are graceful insects, resembling pale, slow-flying damselflies with two pairs of long, transparent wings about equal in size and short, conspicuous antennae. It is almost unbelievable that this attractive parent could give birth to such a grotesque-looking little predator and transmit to it the strange larval pattern of behavior. The larva, with a flat, corrugated body and powerful tong-like jaws, is the true "ant lion" and, as a result of its interesting and unusual habits, receives most of the attention. It has a longer life cycle than most other insects, requiring two, and sometimes three, years to reach the adult stage. Ants, by far, represent the major portion of its prey, though other small insects and even spiders are sometimes consumed.

For many thousands of years, African natives have been digging pitfalls for capturing large edible animals. But ant lions had been using the same technique for countless ages before that. Almost always when we begin to marvel at some ingenious contrivance of man, we find that Nature had "thought" of it and perfected it millions of years before.

Less than a mile from my home is a sandy stretch of ground a quarter of an acre or so in

Death from below *is the fate for any ant unlucky enough to stumble into the pit of an ant lion. This subterranean predator sports a pair of powerful jaws that are used to subdue the ant and crush it. A venom flows from the jaws into the ant, liquefying its tissues. The ant lion sucks the fluid out, then hurls the shriveled husk from its trap like a discarded paper wrapper.*

extent. A long-disused road splits it in half and a busy modern highway runs a few hundred yards below. Here, beneath a rotting stump on the back of the abandoned road, I found a teeming colony of carpenter ants; stretching away from it in two different directions were dozens of ant lion pits, some so close together as to be almost touching. From the overflowing metropolis, ants were endlessly threading their ways among the craters and many were falling in.

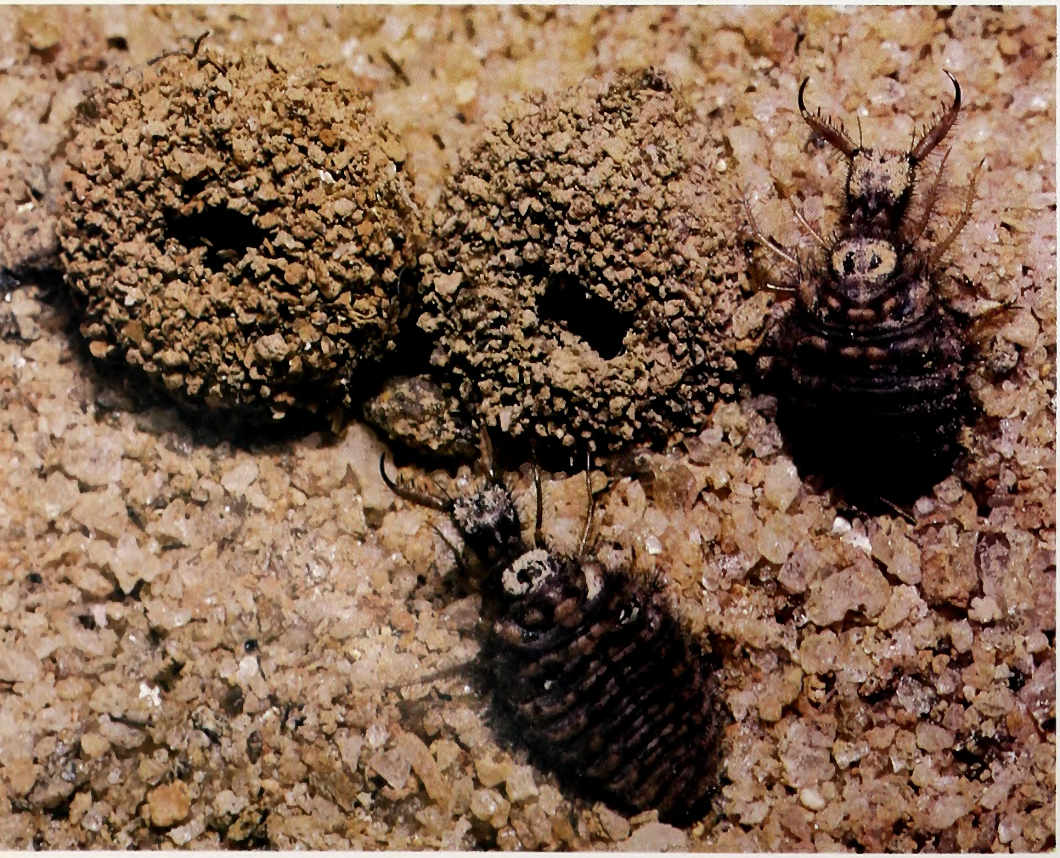
It was here that I did most of my photography and observation of ant lions. This I could best do by lying prone in the sand, with my eyes only a few inches from the tiny subjects. However, it soon became apparent that I was an object of much concern to passing motorists, many of them bringing their cars to an almost complete stop, overcome with curiosity at the sight of a grown man lying full-length in the sand, peering into a camera.

Soon after hatching from an egg, the larval ant lion begins to excavate a pit for itself. Though it has never seen such a pit, and with no guide to point the way, it instinctively knows how to dig one. In its never-ending quest for prey, an ant lion will make many different pits during its long period of larval existence, and if trapping becomes poor in one area it will move to another.

The first thing one notices about the ant lion is that it can walk backward more readily than forward. Using its tail and broad, corrugated back as a plow, it begins by walking backward in a circle some 2 or 3 inches in diameter, and it is this first furrow that marks the outer boundary of the pit. Then, the little excavator continues its gyrations in concentric circles, each one becoming smaller as it burrows deeper and works toward the center and, with violent tosses of its flat, paddle-shaped head, hurls the excavated sand out of the pit.

When the work is finished, there is a cone-shaped pit, amazingly deep and wide, with steep, abruptly sloping sides — one of the most spectacular traps in the animal kingdom. With the pitfall completed, the fierce little predator conceals itself at the bottom, almost buried in the sand, often with only its wide-open, caliper-like jaws protruding. Quietly it waits until an ant or other small creature falls into the yawning mouth of its deathtrap.

Ant lions appear to have a kind of instinctive knowledge of the peculiarity of ants. Upon perceiving any disturbance in the sand, an ant is overwhelmed with curiosity and will leave nothing unexplored. It will approach the rim of every depression — or ant lion pit — and foolishly peer down into its treacherous depths, coming ever closer in its investigation until, on the very brink, the sand collapses beneath its feet and it finds itself helplessly plunging downward. While the ant's inquisitiveness is its own undoing, it



Small craters *(left) are a sure sign of the presence of ant lions. Mostly covered by sand, the ant lion lurks at the bottom of the pit, waiting for ants or other hapless insects to fall in. Spherical sand-covered cocoons made of silk (below) are the underground home for ant lions as they transform from pupae to winged adults.*

all works out very well for the waiting ant lion.

One day last summer I settled down in the sand to watch the ant lions in action. As it was nearing midday when I arrived, heat shimmered in waves across the surface of the roads and the sun-baked fields. Flying insects zoomed and swirled around me, but my attention was fixed on the little craters in the sand and their occupants. The first act of the drama began as an ant approached and began twining its way through the maze of pitfalls. It scurried this way and that, sauntered a bit too near the edge of a crater and, with the abyss looming beneath it, lost its foothold and tumbled over the rim. Desperately it tried to regain its balance, but in vain, for an engulfing avalanche of sand from the steep, crumbling wall swept it downward. Once it seemed on the verge of escape, when suddenly from the bottom of the pit the partially buried ant lion, with quick, jerking movements of its flat head, began hurling a barrage of sand upward, directed with surprising accuracy at the escaping ant, sending it plummeting to the bottom again, into the predator's wide-open jaws. Quickly it was pulled under the sand.

The long projecting mandibles of the ant lion are deeply grooved underneath and serve much like hypodermic needles. Once the struggling ant has been subdued, a dual-acting glandular secretion, containing a powerful, quick-acting venom, flows down each narrow groove and into the ant's body. The secretion also contains a digestive enzyme that turns soft tissues into a liquid, which can be drawn back up through the same grooves and into the ant lion's body. After the unfortunate victim has been sucked dry, its shriveled carcass is hurled up over the rim of the pit.

In watching ant lions, we might easily conclude that their actions — the labor and skill of pit construction, waiting in ambush for prey, the pelting of escaping captives with sand — involve intelligence, planning and foresight. What we see, however, comes not from reasoning power but from following an inherent behavior pattern. That age-old inner urging called instinct provides the young ant lion with all it will ever need to know within the course of its lifetime.

With the coming of autumn, when the crickets have fiddled their last tunes and a numbing cold has crept into the ground, those ant lions that have not reached full larval maturity will descend deeper into the soil, below the frost line. Here, in the dark sheltering earth, they will remain during the months of winter cold, hardly more alive than the tiny, dark pebbles around them. But with the arrival of spring, with sunlight lying warmly on the earth again, comes a new impulsion to move upward toward the light, make new pitfalls and resume their trapping activities.

***Graceful and elegant**, this winged adult ant lion shows few characteristics of its predacious past. Ant lions lay their eggs in the sand and can be seen flitting over the sand from sunset until dusk on still evenings.*

When the larval ant lion becomes full grown and ready to enter the pupal stage of its life, it spins a spherical silken cocoon, about half an inch in diameter, intermixed with quartz grains in the outer layer. Though it is constructed under the shifting sand, not a grain of sand is found inside. Within this globular sphere, an almost magical transformation takes place, as the squat, ugly larva passes a period of pupation that lasts almost two months. Then out of the cocoon, into the brief, flickering life of adulthood, comes an elegant creature with fragile fairy wings. All its prior larval activities have been in preparation for this moment in the light. In its few remaining days it will fulfill one great purpose that seems to motivate all life — the perpetuation of the species.

After its wings have dried and expanded, the newly transformed ant lion floats away high above the sands to find a mate. If it is female, she will lay her eggs in the sand before she dies. Adults are most often seen flitting about during the hours of late evening from sunset until dusk, especially at times when the air is calm and still.

Ant lions are so different from all other insects that sometimes as I lay in the sand peering down into their craters I had an illusion that I had traveled backward over eons of time, seeing creatures of a lost world. Though their activities are less spectacular to observe than rainbows, sunsets, or the migratory flights of wild geese across the autumn sky, they are, nevertheless, almost as remarkable. ⊠

Four years have passed since fire swept 45,000 acres of this game land leaving a blackened wasteland. Today, the scars are healing, and wildlife has rebounded.

LAWRENCE S. EARLEY

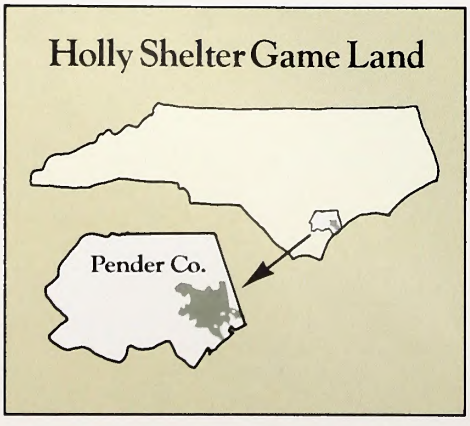
Holly Shelter Lives

by Lawrence S. Earley

Four years after, the fury of the fire is still evident at the Holly Shelter Game Land near Burgaw. In the evergreen shrub thickets known as pocosins, charred poles rise 40 feet high from the thick tangle, all that's left of the mature pond pines that grew here in profusion before May 5, 1986. Toppled trees lie like pick-up-sticks in huge open spaces where the fire burned 4 feet deep into the peat soil.

Yet check out the dense vegetation growing beneath the cemetery of dead pond pines. The red bays and sweet bays have grown back strong. The gallberries have returned and so have the jacket-tearing briers. And don't miss the young pines amidst the tangle. New life is here, hardly what you might have expected after a major wildfire roamed unchecked over this land for nearly two weeks, requiring the efforts of 200 firefighters to extinguish it. Deer tracks pock the sandy roads.

Holly Shelter lives!



Such scenes of rebirth and regeneration remind us of nature's vast recuperative powers. More specifically, they tell us that fire, like Siva, the Hindu god, is simultaneously the regenerator as well as the destroyer of life. It's a lesson worth learning, especially in the wake of the cataclysmic 1988 fire in Yellowstone National Park that polarized citizens and politicians alike.

The Topsail Fire (so named because of its proximity to Topsail Beach) occurred during conditions that could only be termed powder-keg; it wasn't a question of whether a major fire was going to occur, but when. The year before had been a bad drought year, and already 1986 was on its way to being the single worst drought year in the Southeast since records were kept. Hot winds were rattling dying corn stalks across the eastern part of the state and deep cracks appeared in soil usually as wet and gummy as potter's clay. A burning ban was in effect in 64 counties statewide and by May the state Forest Service had posted its highest level of readiness, "Blow-up Alert."

As best as it can be determined, the fire broke out at 3:45 p.m. on May 5 along Highway 17 in Pender County. Most likely started by an arsonist, it twisted and turned like a wild animal across tinder-dry Pender and Onslow counties, fanned by constantly shifting breezes. It came dangerously close to the village of Hampstead and forced its evacuation. By the time the fire was fully extinguished on May 18, it had burned across 70,000 acres of the two counties, 45,000 acres of which lay in Holly Shelter. Over 90 percent of the game land had been torched. Walking through the blackened landscape afterwards, you couldn't have raised a grasshopper.

Vic French then, as now, was a wildlife technician at Holly Shelter and helped fight the blaze. He vividly remembers its frightening power. "We could feel the leaves on the trees blowing as the air was sucked to the fire," he recalls. "It was the type of fire that even when you're standing 200 to 300 yards away in an open field, you don't feel safe. You feel like it could still get you. I've been doing control burns for 12 to 15 years, but a fire this big, you just can't get too far away from it. It was devastating."

Holly Shelter Game Land's 48,795 acres are made up mostly of pocosins, a wetland habitat, interspersed with upland ridges of

LAWRENCE S. EARLEY

***Park-like acres** of longleaf pine (above) show no ill-effects from the intense fire that charred 90 percent of Holly Shelter Game Land four years ago. Wildlife has rebounded strongly. Food plots (above, left) show heavy use by deer. The whitetails have browsed the vegetation except for the portion protected by a wire enclosure.*

longleaf pine. The two habitats couldn't be more different. Pocosins are thickly vegetated with bay trees, thorny greenbriers and other dense evergreen shrubs that bar access to all but the stouthearted. The longleaf pine ridges, on the other hand, are invitingly open and park-like, with a thick carpet of wiregrass that waves in the breezes. Though neither habitat is especially rich in wildlife foods, the 48,795 acres of pocosins and ridges together provide food and cover for deer, black bears, marsh rabbits, bobwhite quail and other small game. Also living here are rarer species in North Carolina, the American alligator and the endangered red-cockaded woodpecker. The red-cockaded woodpeckers build cavities in mature longleaf pines; the alligators haunt a large waterfowl impoundment flooded by the Wildlife Commission; and the black bears roam through the thick pocosins, one of the last habitats for the bears in the East.

The fire that roared through both pocosins and longleaf pine ridges left them charred and blackened. Yet both ecosystems developed in the Southeast and so both are adapted to frequent fire. Scientists estimate that before policies that prevented fire were proclaimed in the early 20th century, summer lightning fires would have swept the southeastern Coastal Plain sometimes for months until checked by rivers. Because fire was so frequent, the fuel loads would have been reduced naturally and consequently the fires would have been mainly low-intensity affairs. Today, wildfires in the Southeast menace people as well as valuable commercial plantations of fast-growing but fire-intolerant loblolly pines.

KEN TAYLOR

Photograph taken *a few weeks after the 1986 fires shows only a small part of the 45,000 acres that was incinerated. Burning for nearly two weeks in drought conditions, the fire threatened houses before it was extinguished. In some areas, the Commission's program of prescribed fires reduced the fuel on the ground and lessened the fire's impact.*

KEN TAYLOR

Charred landscape *greets a bobwhite quail shortly after the fire. Wildlife survival was good, although the more mobile species such as deer and bear had the edge. Small-game species suffered most mortality, but they possess high reproductive rates.*

Big Game Tag Report - Number 14

...a summary of North Carolina's big game harvest for 1989-90 as reported by hunters to Wildlife Cooperator Agents

Why should a hunter go out of his way to tag and report the turkey gobbler he just shot? How many deer were harvested during the season here in North Carolina? Was the total deer harvest for this period greater or less than this figure for last season? How is this information used? These are questions that often surface during discussions of North Carolina's big game tagging system. The big game tagging system is a reporting procedure which requires that all wild turkey, boar, bear and deer which are harvested by hunters here in the state be tagged at the site of harvest and that certain information be reported to any one of approximately 1,500 Wildlife Cooperator Agents for later collection by the Wildlife Resources Commission. This procedure became mandatory in the fall of 1976. Successful game management is based on many factors and individual pieces of information, including in this case, big game harvest figures. The more a game manager knows about population trends and numbers, the easier it is for him to make decisions affecting seasons, bag limits and other regulatory matters. Sound big game management must be the result of the combined efforts of sportsmen and the staff of the Wildlife Commission. While the figures in this report represent the reported harvest and may vary from the actual harvest, they are the best such figures available at this time. Please do your share to see that future reports of this nature are as complete as possible by tagging and reporting your big game harvests and by encouraging your fellow sportsmen to do the same.

If you have questions about the procedures or this report, please contact the Division of Wildlife Management, North Carolina Wildlife Resources Commission, 512 N. Salisbury Street, Archdale Building, Raleigh, North Carolina 27611.

1989-90 Reported Black Bear Harvest

County	Male	Female	Total	Game Land	Other Land	Rifle	Shot Gun	Hand Gun	Gun Unk. Or Other
Avery	3		3	3		3			
Beaufort	9	16	25		25	25			
Bertie	5	6	11		11	11			
Bladen	9	8	17	1	16	14	3		
Brunswick	8	5	13		13	7	5	1	
Buncombe	9	9	18	15	3	18			
Burke	1	2	3	2	1	1		1	1
Caldwell	7	2	9	5	4	7	1		1
Camden	1	1	2		2	1	1		
Carteret	7	5	12	7	5	10	2		
Cherokee	15	13	28	26	2	21	6	1	
Clay	10	16	26	24	2	20	1	5	
Columbus	6	1	7		7	7			
Craven	10	13	23	8	15	20	3		
Cumberland	2	2	4		4	2	2		
Duplin	2	2	4	1	3	3		1	
Gates	5	5	10		10	2	8		
Graham	35	17	52	51	1	43	9		
Haywood	15	14	29	21	8	27	1	1	
Hyde	18	13	31	1	30	28	2	1	
Jackson	5	3	8	8		7			1
Jones	16	8	24	5	19	22	2		
Macon	21	7	28	27	1	27	1		
Madison	19	14	33	29	4	30	2	1	
McDowell	10	9	19	13	6	13	6		
Mitchell		2	2	2		1			1
New Hanover		3	3		3	3			
Onslow	9	13	22		22	20	2		
Pamlico	5	4	9		9	9			
Pasquotank	5	3	8		8		8		
Pender	12	11	23		23	18	2	3	
Rutherford	1	2	3	1	2	3			
Sampson		2	2		2	1	1		
Swain	4	1	5	3	2	4	1		
Transylvania	3	4	7	6	1	7			
Tyrrell	13	2	15		15	13	2		
Washington	3	3	6		6	5	1		
Wilkes	2		2	1	1	1	1		
Yancey	12	8	20	2	18	16	3	1	
Totals	317	249	566	262	304	470	75	17	4

1989-90 Reported White-Tailed Deer Harvest

County	Sex Harvested				Antlered Bucks Per Sq. Mile	Weapon					Location	
	Antlered Bucks	Button Bucks	Does	Total		Shotgun	Rifle	Muzzle-Loader	Bow	Hand-gun	Game Lands	Other Lands
Alamance	426	41	98	565	2.23	53	355	107	44			565
Alexander	180	21	67	268	1.08	8	151	54	50	1	4	264
Aleghany	690	90	231	1,011	5.70	24	552	241	187	2		1,011
Anson	1,045	160	665	1,870	2.96	316	1,155	243	120	6	33	1,837
Ashe	609	77	214	900	2.50	3	434	291	160	7	12	888
Avery	86	3	10	99	0.47	1	78	9	10		64	35
Beaufort	1,185	156	778	2,119	2.51	151	1,801	71	21	9	22	2,097
Bertie	1,540	273	1,224	3,037	3.10	1,783	1,086	62	35	2	40	2,997
Bladen	2,546	323	1,607	4,476	3.82	2,213	1,928	146	95	3	102	4,374
Brunswick	1,409	159	785	2,353	2.17	1,658	524	74	33	13	52	2,301
Buncombe	135	24	258	417	0.32	9	363	17	21	1	48	369
Burke	742	59	272	1,073	1.92	33	776	119	117	3	210	863
Cabarrus	56		6	62	0.36	38	5	10	8			62
Caldwell	415	27	89	531	1.16	21	410	41	55	2	162	369
Camden	195	7	26	228	1.35	113	111	1				228
Carteret	333	25	151	509	1.11	199	251	37	8	1	80	429
Caswell	1,268	211	657	2,136	4.86	662	907	393	147	8	196	1,940
Catawba	154	9	60	223	0.96	11	125	38	45		2	221
Chatham	1,333	112	540	1,985	2.83	185	1,054	448	273	9	373	1,612
Cherokee	26			26	0.07	5	19	1			21	5
Chowan	449	44	260	753	5.48	233	444	38	21	5	1	752
Clay	38		2	40	0.22		37	1	2		29	11
Cleveland	239	8	37	284	1.15	8	235	22	18	1	11	273
Columbus	1,744	109	704	2557	2.68	1,380	963	113	28	4		2,557
Craven	1,495	89	544	2,128	3.01	268	1,596	123	50	1	99	2,029
Cumberland	1,006	173	656	1,835	2.74	230	1,444	74	61	4		1,835
Currituck	316	37	117	470	2.98	141	291	20	11	1	1	469
Dare	146	10	22	178	0.56	59	68	37	10		122	56
Davidson	621	62	234	917	2.40	45	571	154	111	5	35	882
Davie	361	27	100	488	3.25	23	283	110	65	1		488
Duplin	1,158	59	296	1,513	2.51	563	863	33	16	2	4	1,509
Durham	191	23	62	276	1.25	107	95	50	23		96	180
Edgecombe	1,450	221	1,157	2,828	5.85	914	1,614	144	75	10		2,828
Forsyth	53	3	7	63	0.38	6	39	9	7			63
Franklin	909	98	279	1,286	3.26	757	418	48	32	7	34	1,252
Gaston	35		4	39	0.20	5	23	6	4	1		39
Gates	1,002	259	888	2,149	4.14	1,619	388	51	29	13	39	2,110
Graham	29	1	2	32	0.11	1	28		2		29	3
Granville	1,197	113	444	1,754	3.64	450	871	273	144	4	137	1,617
Greene	205	4	14	223	1.67	89	123	2	4	2		223
Guilford	232	14	41	287	0.95	45	143	50	42			287
Halifax	1,920	339	1,588	3,847	4.74	1,076	2,365	169	67	16	34	3,813
Harnett	203	2	29	234	0.61	102	91	14	17	2		234
Haywood	154	20	64	238	0.38	5	173	14	40		220	18
Henderson	161	5	46	212	0.71	11	145	15	25	2	103	109
Hertford	555	90	340	985	2.38	690	261	7	3			985
Hoke	156	1	24	181	0.62	130	28	4	11			181
Hyde	786	118	605	1,509	2.26	298	893	171	95	4	61	1,448
Iredell	537	63	153	753	2.16	37	449	166	88	1	2	751
Jackson	14			14	0.03		14				14	0

1989-90 Reported White-Tailed Deer Harvest

County	Sex Harvested				Antlered Bucks Per Sq. Mile	Weapon					Location	
	Antlered Bucks	Button Bucks	Does	Total		Shotgun	Rifle	Muzzle-Loader	Bow	Hand-gun	Game Lands	Other Lands
Johnston	435	13	104	552	1.10	118	364	21	43	2		552
Jones	1,391	116	704	2,211	3.91	200	1,843	81	32	3	127	2,084
Lee	244	5	52	301	1.48	25	201	40	27		20	281
Lenoir	514	27	156	697	2.69	100	549	22	12		7	690
Lincoln	71	2	13	86	0.49	6	47	13	20			86
Macon	115	1	7	123	0.26	3	102	5	10	1	97	26
Madison	122	11	39	172	0.36	8	122	14	28		108	64
Martin	898	67	383	1,348	3.14	639	626	41	15	2	8	1,340
McDowell	367	29	107	503	1.01	13	368	46	67	1	188	315
Mecklenburg	62	9	31	102	0.27	51		33	17			102
Mitchell	174	8	38	220	1.07		133	22	58		51	169
Montgomery	1,572	238	625	2,435	4.02	195	1,446	510	247	7	327	2,108
Moore	398	40	117	555	0.76	357	135	41	12		8	547
Nash	514	38	158	710	1.86	324	344	11	15	1		710
New Hanover	98	10	56	164	0.97	57	91	7	5	1		164
Northampton	1,617	286	1,245	3,148	5.07	1,455	1,447	122	38	5	9	3,139
Onslow	1,436	170	793	2,399	2.68	1,214	905	89	49	4	43	2,356
Orange	574	37	174	785	2.55	157	365	171	79	3		785
Pamlico	471	18	169	658	2.48	44	557	31	10		1	657
Pasquotank	129	16	21	166	1.57	40	117	3	1	1		166
Pender	1580	115	707	2,402	2.20	890	1,267	114	65	5	89	2,313
Perquimans	491	30	174	695	4.20	253	399	10	20	3		695
Person	685	66	247	998	3.17	343	431	157	53	3	40	958
Pitt	921	70	394	1,385	3.02	127	1,125	56	32	7		1,385
Polk	225	11	37	273	1.26	8	207	19	28	1	104	169
Randolph	600	56	153	809	1.26	68	501	133	102		45	764
Richmond	718	77	300	1,095	2.03	589	414	63	20	11	104	991
Robeson	457	46	282	785	1.05	473	257	18	18	1		785
Rockingham	675	51	191	917	2.23	122	521	138	121	1		917
Rowan	447	42	166	655	2.00	58	392	112	83	2	30	625
Rutherford	542	28	122	692	1.35	20	565	59	43		73	619
Sampson	1,007	55	330	1,392	1.87	434	818	33	45	1		1,392
Scotland	446	48	166	660	2.41	489	127	7	29	1	132	528
Stanly	533	59	214	806	3.25	78	509	127	81	1	10	796
Stokes	224	20	49	293	0.84	35	157	42	55	1	3	290
Surry	287	13	70	370	1.05	30	233	54	48	2		370
Swain	25		1	26	0.05	1	20	3	2		11	15
Transylvania	174	7	31	212	0.53	4	152	15	31		161	51
Tyrrell	283	7	49	339	1.14	28	251	41	9	2	5	334
Union	103	1	1	105	0.38	9	89	2	4			105
Vance	424	22	86	532	3.05	190	269	40	19	3	26	506
Wake	342	10	73	425	0.77	63	275	39	39	1	92	333
Warren	930	154	547	1,631	3.13	935	612	41	14	5	14	1,617
Washington	434	29	129	592	2.82	89	404	58	27	1	7	585
Watauga	93	3	8	104	0.50		60	20	23		4	100
Wayne	178	4	49	231	0.74	42	152	23	11			231
Wilkes	947	84	256	1,287	1.71	16	748	323	184	3	79	1,208
Wilson	73	1	6	80	0.46	28	49		1	1		80
Yadkin	259	9	16	284	1.90	9	174	50	51		4	280
Yancey	255	9	55	319	0.99	1	197	30	87	2	122	197
State Total	57,295	6,037	26,358	89,690	1.93	27,216	48,178	7,471	4,660	232	4,632	85,058

1989-90 Reported Wild Boar Harvest

County	Male	Female	Total	Game Land	Other Land	Rifle	Shot Gun	Hand Gun	Gun Unk. Or Other
Cherokee	12	6	18	14	4	13	2	2	1
Clay	5	4	9	9		7	1	1	
Cleveland	2	4	6		6	5		1	
Graham	54	48	102	97	5	90	9	1	2
Jackson	1	1	2	1	1	2			
Macon	3	4	7	7		7			
Transylvania	1		1		1	1			
Swain	2		2	2		2			
Totals	80	67	147	130	17	127	12	5	3

1989-90 Reported Wild Turkey Harvest

	Age				Location			Weapon Used			
County	Adult	Juvenile	Unk.	Total Reported	Game Land	Other Land	Unk. Land	Shotgun	Bow	Muzzle	Unk.
Alamance	17		2	19		19		18			1
Alleghany	52	26	1	79	1	68	10	77	1		1
Ashe	113	41		154	4	115	35	148			6
Bertie	48	12		60		54	6	57			3
Bladen	2	2		4	3	1		4			
Buncombe	25	6		31	11	13	7	30		1	
Caswell	223	12	3	238	35	203		224		1	13
Chatham	16	1		17	4	12	1	15			2
Cherokee	70	4	1	75	63	7	5	69			6
Chowan	4	1		5		5		5			
Clay	27	1		28	28			28			
Columbus	1			1		1		1			
Durham	1			1		1		1			
Franklin	1			1		1		1			
Graham	35	1		36	25	11		36			
Granville	18			18	3	14	1	16			2
Halifax	22	5		27	1	23	3	26			1
Haywood	6			6	3	2	1	6			
Henderson	15	2		17	14		3	17			
Hyde	4			4		4		4			
Jackson	2	1	1	4	2	2		4			
Macon	54	3		57	43	10	4	57			
Madison	10		3	13	13			13			
Martin	15	4		19		16	3	19			
McDowell	14	1		15	14	1		14			1
Mitchell	9		1	10	6	4		10			
Montgomery	11			11	1	10		11			
Moore	3			3	1	3		3			
Northampton	24	7		31		31		30			1
Onslow	34		1	35		30	5	20			15
Orange	19			19		16	3	19			
Pender	1			1		1		1			
Person	70	4		74	6	58	10	69			5
Richmond	17	1		18		18		18			
Robeson	1			1		1		1			
Rockingham	20		1	21		21		21			
Stokes	1			1		1		1			
Surry	24	2		26		26		23			3
Swain	4	1		5		5		5			
Transylvania	30	11		41	27	3	11	40			1
Union	1			1		1		1			
Vance	1			1		1		1			
Wake	1			1	1			1			
Watauga	29	2		31	3	19	9	28	1		2
Wilkes	10	4		14	3	11		14			
Yancey	1			1		1		1			
Totals	1,106	155	14	1,275	315	844	117	1,208	2	2	63

KEN TAYLOR

The blaze burned *as much as 4 feet into the peat soil of pocosins, leaving the roots to these trees exposed. Four years later, the dead trees had toppled, yet ranks of young pond pines show that natural regeneration has been successful.*

For these reasons they are heavily controlled.

"The N.C. Forest Service estimated that before the fire we had 15 to 30 tons of consumable fuel in our pocosins per acre," says French. "That's like painting the woods with gasoline." The Wildlife Commission generally reduces fuels in its game lands through a program of intentional burning, called "controlled burns," but the fuel loads were too high to make controlled burns feasible. Thus when the wildfire hit the fuel-laden pocosins, it practically exploded, killing nearly 100 percent of the pond pines and burning deeply into the organic soil.

Of course, pond pines are not particularly resistant to fire anyway. Their adaptation to fire is their serotinous pinecone, one that opens and releases seed only in the presence of fire. The seed falls into the ash and the young pine grows quickly. The result is a new forest of even-aged pond pines. Though the Holly Shelter pocosins lost all their mature pines, regeneration was superb.

"Fire is a regenerator of pocosins," French says. "It keeps the pocosin ecosystem alive, so the long-term damage to the pocosins was virtually nothing. Eventually the dead timber will topple and the young trees will grow up and it'll look exactly like it did before."

The longleaf pine forests fared even better than the pocosins, emerging nearly unscathed from the fire. Longleaf pine ecosystems are adapted to low-intensity fires in many remarkable ways (see "People in the Pines" and "Looking for Longleaf," December 1986 and August 1988). As long as fuels are kept low, fires won't kill trees.

"We've got about 8,000 to 10,000 acres of longleaf pine and wiregrass, but they are under an aggressive burning program, on a three-year rotation, so we had the fuels under control," says French. "And you can tell, because we lost virtually none of our longleaf pine trees. But adjacent private lands that had not been in a burning program lost a lot of trees." In the days following the fire, a hard 3-inch rain mainlined the released nutrients into grasses and herbaceous vegetation. In three days, the native wiregrass was greening out in succulent shoots once again.

One casualty of the fire was Southwest Ridge, a property adjoining Holly Shelter that contained a rare stand of 200-year-old longleaf pines with a colony of red-cockaded woodpeckers. Caught between the advancing head fire and the backfire, the ridge was incinerated by the intense blaze. "Some of the helicopters in the air at the time said that as the two fires approached, the tips of the flames leaned over and touched," says French. "It was like a tunnel of fire that was basically about a quarter of a mile apart. And when they converged, the flames shot 1,000 feet into the air."

"Over 90 percent of the adult longleaf trees were killed by the intense fire," reports Carol Mayes, director of stewardship for The Nature Conservancy, which owns and manages the property. "The red-cockaded colony has not been seen since and is presumed to have been killed by the fire." Though the loss of the old-growth trees was tragic, regeneration has been good and Mayes expects the habitat to recover fully.

Holly Shelter's wildlife have emerged from the fire in good shape, although there were casualties. Helicopter surveys flown just after the fire by Scott Osborne, the Wildlife Commission's deer project leader, revealed a loss of 34 deer on the game land and 12 more on adjacent lands. He estimated that between 5 percent and 10 percent of the deer herd was killed, most of the mortality occurring in a line between the head fire and the backfire. One dead black bear was found out of the approximately 40 bears that use the game land. The highest mortality was probably among the small-game populations and animals that were the least mobile.

"Yet what you have to remember," says French, "is that small game have the highest reproductive potential, so that though they may have suffered the greatest losses, they also experienced the fastest rate of recovery." Biologists say that the deer population is today back at levels higher than before the fire and bears are beginning to use the pocosins once more. By creating roosting habitat in newly opened woody vegetation along Ash Creek, near the impoundment, the fire benefitted wintering waterfowl as well.

The preliminary assessment of biologists immediately after the fire was that its effects on wildlife were minimal. In general, the fire would serve to enhance most wildlife populations in the coming years. The young vegetation would be more palatable and nutritious and would increase the carrying capacity for most animals. In the years since this assessment, biologists have seen nothing to cause them to change their minds.

"In this kind of habitat," says French, "fire is a natural part of the ecosystem, and if it were a limiting factor in wildlife populations we wouldn't have the abundance of wildlife that we do. Wildlife have adapted to fire and flourish with it."

In some places in Holly Shelter, it's hard to believe there ever was a fire of the magnitude of the great fire of 1986. The longleaf pine ridges especially look unmarked. Since the fire the Wildlife Commission has burned the ridges and they look as prairie-like and inviting as they did in the months before May 5, 1986. Plans are in place to burn the pocosins as well, but technicians haven't found that magic "window of opportunity" to do it safely. "We've been working with the Forest Service closely," says Vic French, "but those pocosin soils are either too wet to burn or when they will burn it's too dangerous."

Holly Shelter, like other Coastal Plain habitats, will always live with the threat of fire, much as it has for thousands of years. "A big fire will come again one day," says French. "Who knows when? If it burns within the next 10 years, however, it'll burn a lot faster and a lot less dangerously than it did in 1986 because it'll have much less to consume." The lesson from this fire and the great Yellowstone conflagration is that these habitats have tremendous resilience. Though fire burns, it does not always destroy. ☒

THE ART OF BOTANICALS

Long before there were cameras, exploring botanists made highly specialized drawings of species they collected. Linda Funk's art follows this historic tradition.

illustrations by Linda Funk

PHOTOGRAPHS BY KENNETH WOISARD

private collection

Wild Columbine (*Aquilegia vulgaris*) (16" x 20")

I've always been fascinated with columbine because of the intricacy of its blossom. It's also beautiful. The blossoms last a long time so they give me plenty time to work with them and that's important for a botanical illustrator. This columbine grows wild in Maine.

In 1981, an editor for *Wildlife in North Carolina* saw some of Linda Funk's black-and-white artwork and asked if she would do a color illustration of poison ivy for an upcoming article.

"I told him I was strictly a black-and-white illustrator," she recalled, "but I gave it a try. I bought colored pencils and watercolors and played with them for a week. I really didn't know whether I could pull it off. But I did the drawing and people liked it. And that's how I began my career in botanical illustration."

It's not often we can say that we played even such a minor role in an artist's discovery of her life's work, but we're glad it seems to have worked out that way in Linda's case. And how lucky for *Wildlife in North Carolina*, nine years later, to celebrate the fruition of her talent.

It's hard to believe that Linda's talent is mostly homegrown. Though she was one of those crackerjack students who always seemed to come up with great-looking decorations for classrooms and school proms, she never took an art course until her career was well underway. She lived in Raleigh from 1971 to 1984. She stayed home with her four small children at first, and then from 1975 to 1979 she had a job writing, illustrating and designing guidebooks on historic sites for the Department of Cultural Resources. "I knew nothing about putting together a book because my background is in education and psychology," she says, "but I knew what I wanted and pretty soon I was doing everything from research to pasteup."

After freelancing in the Raleigh area, she moved to Blue Hill, Maine. But by that time she had discovered botanical illustration, and she continued to work on it while freelancing. Then, just a few years ago, she decided to devote all of her time to botanicals. She studied in England with a well-known illustrator, and in the years since, although she still considers herself a student, her star is rising in the exacting world of botanical illustration. Here's what Linda Funk says about her work:

"Botanical illustration is a vast field with hundreds of years of history. The earliest flower drawings were made primarily to edify the search for herbs and simples (medicinal plants). In the 17th century, illustrations of the beautiful and rare plants of wealthy patrons replaced the merely useful plants. During this period the flower painter flourished, as the science of botany developed and bright books portraying flowers were in demand. During the second half of the 19th century, botanical illustration degenerated, mostly because of the growth of cheaply produced reproductions. In the 20th century, photography has largely replaced illustration of plants and flowers, though botanical illustration is having a resurgence.

"Plants and flowers are my passion. In describing plants through botanical illustration I am committed to satisfying the discerning eye of the botanist, as well as the untrained lover of flowers. Botanical illustration is a specialized art that reveals a world of beauty. Working with plants and flowers requires patience, perseverance and a certain amount of ingenuity in order to keep up with nature. Botanical subjects are moving and changing ever so slightly moment by moment, testing the eye and hand of the artist. Petals open and close, plant stems flex and curve. Their colors are often so dazzling that they are difficult to approximate with paint on paper.

"The botanical artist must serve both science and art. It is truly an art to incorporate 'soul' into the representation of a flower on paper. Obviously, it's also advantageous to understand not only the use of the medium (pencil, watercolor, pen and ink), but also the plant's structure and the function of its various parts. To make a portrait of an individual plant means learning how the plant unfolds its bud, how it unfurls its leaf. It means observing its veining, the texture and shading of its petals, the structure of its pod and seeds, the way it withers and changes in form and tonal values until it finally drops its petals.

"In composing the drawing, I begin on tracing paper and produce an accurate pencil drawing in full detail. When I'm satisfied with the drawing, I transfer it very faintly to a sheet of hand-made paper. I begin with pale or bright washes of watercolors, lay on further washes after each is dry, and finish with dry-brush technique for additional shading and details, working into the darker tones, building and shaping the image. It can take anywhere from a month to two months of sometimes 10-hour days to produce a finished watercolor. The need for accuracy is so demanding that I work with a magnifying glass, first to see exactly how the plant is constructed, and then when I'm painting it.

"What could be more pleasurable than drawing and painting flowers? I am dedicated to their accurate depiction, both realistically and romantically, conveying beauty of form, depth of coloration, and the radiant spiritual essence with which these glorious creations enhance our planet and our very being."

— Lawrence S. Earley

***Artist Linda Funk's** botanical illustrations have put her on the high road to recognition. Botanical art is laborious, requiring accuracy and beauty.*

private collection

Lupine *(Lupinus polyphyllus)* (15″ x 21¼″)

In early June, fields of lupine grow here, and in all colors — pink, blue, purple, coral, white, and combinations. I've shown views of a closed seed pod, an open pod and the seed. Along the bottom are different views of a dissected blossom. This is done to enlarge the blossom so the detail is more visible.

private collection

Iris (12½" x 15½")

I love gardening. This iris grew in my garden. I waited an entire season for it to blossom. The blossoms last only a day so I had to plan. I cut a stalk with lots of buds and began to work. As each bud blossomed and faded, another one was right behind it so I was able to work from life for several weeks. The bud of the iris is shown as well.

private collection

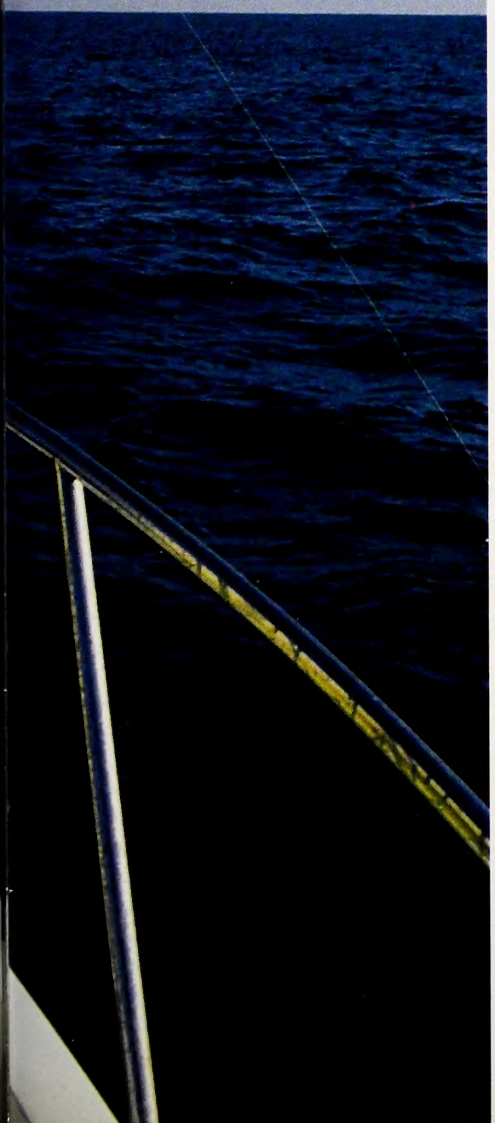
Black-eyed Susan *(Rudbeckia hirta)* (20" x 28")

In late summer and early fall, these flowers grow in great profusion. In my painting, I've shown different colored centers that are from different forms of the flower. I've tried to portray them as they grow in the field. I sometimes drive miles and miles to find new flowers after the ones I'm working on have faded or died.

private collection

Monkshood (*Aconitum anglium*) (15" x 21¼")

I began this painting while studying in England. I picked the plant one morning when the field was blanketed in fog and I could see all these purple spikes sticking up. I used another specimen to complete it the following year. On the right side of the painting I've illustrated a dissected petal of the flower.



The Perfect Boat

Looking for the ideal all-round coastal craft? Perfection may be impossible, but these tips will help you get close.

written and photographed by Joel Arrington ©1990

A vast array of boat brands, models and sizes bobs enticingly before a potential first-time buyer today. The proliferation of designs is daunting. Even a small boat requires a major expenditure at most income levels, so no one wants to make a mistake and buy an unsuitable craft. Also, new boats depreciate so fast it makes it difficult to recover much of the purchase price, so once you buy a boat it is well to get a few years' use before putting it on the market.

How to choose the perfect boat?

Of course, no perfect craft exists, never did, never will. However, with thoughtful analysis buyers can certainly choose a craft well suited to the particular conditions and uses to which it will be put.

Possibilities run from paddling around a pond to offshore excursions for giant fish, but suppose we limit our choice to a boat suitable for brackish and saltwater fishing. This is, after all, one of the fastest-growing interests among American anglers. And let's say you want to fish North Carolina's sounds, around the inlets and maybe a little out to sea, but you do not anticipate making long trips to blue water.

That narrows your choices considerably, but when you look at the enormous range of boating conditions in the coastal part of the state, you see the perplexing decisions yet to be made. The chain of narrow sounds south of Morehead City seldom offers difficult conditions, but Pamlico Sound is a large inland sea. Storms there have sunk commercial vessels like trawlers and tugs and ended seamen's careers, if not their lives. Pamlico's size produces wind with sufficient fetch to build 4-foot seas even at velocities under 20 miles per hour. You may expect winds in excess of 20 miles per hour 46 percent of the time in winter, 35 percent of the time in spring, 28 percent of the time in fall, but only 10 percent of the time in summer. Albemarle Sound, too, is vast. These windy places are also shallow, which means narrowly spaced, steep, breaking seas. While calm conditions sometimes prevail, boats designed for lakes will give a poor ride, to say the least, most of the time. Hulls with soft entry, meaning a 30- to 40-degree angle to the vee in the bow, and good spray control serve the boater far better on big water.

North Carolina's Coastal Plain is covered with sand that, in water and wind, moves constantly, filling former channels and sometimes leaving boaters to guess where shoals lie. Despite our best efforts, we constantly run out of water and shine our props, or worse. Shallow-draft boats are useful if not absolutely necessary for predominantly inshore use; therefore, most small craft on North Carolina sounds have hulls that progressively flatten toward the stern to an angle of 12 to 18 degrees.

***A big,** fast-moving gamefish can be a handful, especially if you're stumbling over gear and have no room to maneuver. For fishing, the best boats have plenty of room and clear, uncluttered decks both fore and aft. These anglers share the foredeck while playing fish.*

The center console *(above) is popular along our coast, and it permits fishermen to move around freely. However, it doesn't provide much comfort or protection from the elements. There are better interior designs, particularly the walk-around cabin or cockpit.*

This hull is often referred to as semi-vee or modified vee. Linwood Parker of Parker Boats in Beaufort says that his designs evolved from boats used by commercial fishermen. "They need stability and big load-carrying capacity. Recreational boaters want much the same thing — a large, stable, dry fishing platform." Parker builds fiberglass boats 17 to 25 feet in length.

The semi-vee is not as good in shallow water as a flat-bottomed boat, like a johnboat, nor is it as good in big seas as a deep-vee, which has a sharp entry forward and retains much of that angle to the stern. The main problem with the deep-vee hull is that it is less stable than a flat-bottom or semi-vee design. Still, if you expect to make frequent long runs in big seas, that's what you want. All other things being equal, the flatter the bottom, the more stable the boat and the more economical it is to run. A flat-bottom hull floats more on the surface and offers less friction as motors push it through (or over) the water. It can take more weight on its sides before tipping than a deep-vee, but in any sea at all, it will bang unmercifully. Because so much of a deep-vee hull floats beneath the waterline, it needs a lot of power to push it and thus is less economical to run. At slow speed and at anchor, a deep-vee also rolls badly compared to flatter designs.

What coastal boaters really need are hulls that can be configured as they run to adjust to variable conditions. (A prototype has been built in Australia.) But until manufacturers learn to make adjustable hulls, buyers must pay their money and take their choices. Considering the trade-offs, a good deal of experience by a lot of manufacturers and boaters in this state suggests that, for nearly all inshore use, the semi-vee design is the best choice for cruising and fishing.

That gets us a long way in the process of choosing a boat, but many important decisions remain, and they all relate to how the boat will be used. If you plan to do a lot of cruising and expect to sleep and cook in the boat, then you will want an entirely different internal design than someone who wishes mainly to fish, returning to the dock at day's end. Naturally, some boaters want it all. They want to fish and they also want at least the option to spend the night in the boat at some anchorage or at the dock. Manufacturers try to accommodate them.

Boats that are highly successful in other parts of the world can be poor choices for North Carolina waters, and vice versa. The Florida flats skiff, for example, with a small console, very shallow draft and light weight, would be useful only about 20 percent of the time for about four months out of the year at this latitude. Center console designs are similarly on the margin of their range in North Carolina because they do not offer boaters sufficient protection from the elements on the shoulders of the fishing and boating season, although unquestionably this design yields more fishing room compared to cabin configurations. Much of our best fishing occurs in spring and fall when we might have highs only in the 50s and spray feels like buckshot. Most North Carolina boaters need more protection than a center console offers, as well as a place to lie down, lock valuables and store equipment. Some of us want privacy for a head.

Grady-White Boats in Greenville has popularized the walk-around cabin, a great idea in boat design. Every boater needs access to anchor and dock lines, and anglers often need to play fish around the boat. The walk-around cabin now found in many brands gives passengers spray and wind protection and vee-berths, as well as bow access. When combined with a canvas and plastic top, the dual console concept, another clever industrial design, gives protection with headroom not only for the helmsman, but for passengers as well.

But, again, interior design should be determined by how you plan to use your boat. The kind of fishing you do, for example, is critical. If you troll, you will want more room in the cockpit. Casters want large, clear areas forward of the steering station and are willing to sacrifice cockpit room to get them. Live-bait fishermen don't need so many chairs as trollers and should give careful consideration to where they will place a bait tank. A few boats still have those awkward live wells in the deck that force anglers to stand on their heads to retrieve a bait. Yet a tank above the cockpit sole is sure to be underfoot. Only large boats can accommodate them near the slosh well and still leave sufficient foot room around them. Bait tanks are ideally located about belt-high. Some larger craft have them built into the transom.

Power options are another big decision. For boats in the size we are referring to here, inboard engines are too heavy and their shafts and propellers ride too deep. Inboard/outboard engines, according to some experts, are not quite as durable as outboards in a salt-water environment and give only slightly improved fuel economy. Frank Longino of Grady-White Boats recalls that a few years ago, inboard/outboards were as much as twice as efficient as outboards, but now the advantage is less than 20 percent. Inboard/outboards are also heavier than outboards with equal horsepower.

If you go with outboard power, you still must decide how many engines you want and whether to put them on brackets or directly on the transom. Brackets place them farther from passengers and thereby reduce noise. That added distance makes the boat perform as if it were longer, giving a better ride, but the downside is that the outboards are in the way when you are playing fish off the stern. This installation also permits a higher transom, but Parker says that is mostly a perceived advantage. People feel safer with high transoms, but

water coming over the stern never has been a problem.

Should you get one large outboard or two small ones? The original idea for dual installation was based on dependability. If one motor failed, you had the other. But research shows that most outboard failure is related to fuel. Unless your two motors have separate, independent fuel tanks — and few are set up that way — you have gained little over a single-engine installation. Since Japanese manufacturers entered the outboard industry, competition has produced much-improved and cheaper (in terms of cost per horsepower) outboards that are much more dependable than ever before. A single large engine is less costly than two of equal horsepower and remains a good choice.

Fiberglass, which is made from relatively abundant and inexpensive petroleum products, is far and away the most popular material for recreational boats. Some feel, however, that advancing technology has brought better materials and methods for boat construction than traditional wood and fiberglass. Kevlar, for example, is stronger, lighter and stiffer, but more expensive. With it, boats can be made much lighter overall, but not everyone agrees that is a good idea. "I don't think there's any substitute for heavy fiberglass construction," Parker says. "High-tech materials are great for saving weight on high-speed racing hulls, but for comfort in day-to-day usage and in the rigors of big seas, you need a heavy, over-built boat."

Longino agrees. "Light, fast boats, especially semi-vees, are uncomfortable. In larger craft, where you have a lot of weight anyway, you can use balsa coring and other weight-saving techniques and materials," he says, "but in a small fishing boat, you really need weight going into those waves."

Longino checked off a list of features he feels a buyer looking at boats for North Carolina's sound and inshore ocean waters should consider: heavy construction, design that permits walking all around the boat, a modified vee hull, trim tabs, a locking box for electronics and fish boxes built into the boat.

Most experienced boaters would agree. Trim tabs so improve boat performance and comfort that some manufacturers supply them as standard, and most buyers should consider them. Tabs make your boat perform as if it were longer. When running in beam seas, your craft will list to leeward so that you are riding on the flat side of your vee hull. Tabs will level your boat for a much softer and dryer ride.

If you don't have to disconnect your LORAN, radio and fathometer and haul them inside every time you come in for fear of theft, you save a lot of hassle. Just lock them up and feel reasonably secure. Longino says that fish boxes and bait wells placed above the deck give fewer problems than those built below the cockpit sole, where they must be pumped. Gravity is a more dependable force.

No, there is no perfect boat, not even a perfect boat for any one application. Careful thought about where you plan to use it and for what purpose, however, will point toward the one that is best for you. ☒

***You see many** types of boats at marinas along the coast, some better suited to fishing than others. The key factors to consider when buying a boat are how and where you plan to use it. For most inshore salt-water fishing, a semi-vee fiberglass hull is the best compromise in terms of comfort, economy and safety.*

Volunteers Needed to Count Birds

Endangered Piping Plover Makes Stand in North Carolina

Written and Edited by Vic Venters

In the early 19th century, shorebirds like the piping plover were so abundant on the Atlantic Coast that one observer wrote: "One hardly dares to estimate their numbers for fear of being taken for a mere prevaricator."

Today, unfortunately, the piping plover population is very countable — there are perhaps 2,000 breeding pairs scattered through the Midwest, the Great Lakes states and the Atlantic Coast. This small, sand-colored bird is now fighting for survival and North Carolina's barrier islands provide some of the best habitat for the Atlantic Coast population. The piping plover's status in North Carolina is unique because the state is the only place on the Atlantic Coast where this endangered shorebird both breeds and winters in significant numbers.

Commercial gunning in the market-hunting era at the turn of the century decimated bird populations and drove the piping plover and many other shorebirds to near extinction. After shorebird hunting was regulated in 1918, plover populations rebounded through the 1940s, until coastal development and consequent human activity sent the plover population spiraling back down.

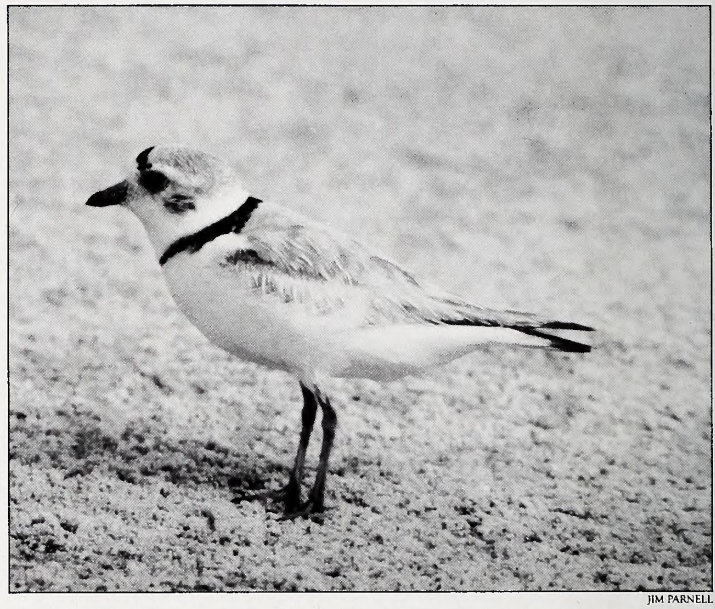
In 1986, the piping plover was added to the federal endangered species list. The U.S. Fish and Wildlife Service, along with a host of other national and state agencies, have been managing habitat to address the plover's plight. In some states, experimental wire enclosures, selected beach closures and education campaigns have resulted in higher hatching rates. In North Carolina, the Wildlife Resources Commission, in a cooperative agreement with other public landowning agencies like the National Park Service, will bar trespassing in plover and other shorebird breeding sites from April 1 to August 31. Because piping plovers breed about the same time people begin packing the beaches — in late May, June and early July — chances for disturbance by humans is great.

"The purpose of this posting is to protect breeding shorebirds like the piping plover and other rare species," said Randall Wilson, chief of the Commission's Nongame and Endangered Wildlife Program. "At some sites, these birds may look plentiful but they might represent the entire state population for a rare species."

The intensive management appears be helping the piping plover. Nesting pairs on the Atlantic coast increased to 709 in 1989, up from 644 in 1988. A recent state survey counted 55 pairs breeding in North Carolina — about 8 percent of the population. Wintering activity is also significant, with about 23 percent of the Atlantic Coast population thought to migrate here. "I estimated that we had about 80 birds wintering along the coast last fall," said John Fussell, a consulting biologist hired by the N.C. Wildlife Resources Commission to conduct population surveys in North Carolina. "In contrast, in the early 1970s I counted as many as 100 birds at one site."

Fussell fears last December's brutally frigid weather hurt the wintering population. "In four areas, we counted 27 birds. After the storm, we only found five. These birds may have moved south but I feel a lot of this decline could represent mortality from the cold."

Breeding piping plover populations have been especially vulnerable because of the bird's highly specific habitat requirements. Unlike many shorebirds that breed undisturbed by humans in the arctic, the piping plover's breeding range is from North Carolina to the Northeast — a region where coastal development has been intense.



JIM PARNELL

Plight of the Plover: *The diminutive piping plover is in serious trouble because of destruction of its barrier-island habitat. At last count, there were only about 4,000 of this species left, with North Carolina remaining a major breeding and wintering area.*

Piping plovers also use specific locations for their nests, which are simple depressions scraped in the sand. They must have a combination of coarse sand located near mud flats in areas such as washovers on barrier islands. This is the type of habitat that has nearly disappeared from the state, except on undeveloped stretches of the Cape Lookout and Cape Hatteras national seashores. Nor have piping plovers been found to nest on the relatively abundant spoil islands in the state. "Because piping plovers don't use spoil islands, they have not been able to compensate for the loss of natural breeding habitat," Fussell explained.

Next year, the Wildlife Resources Commission will help with a survey to count piping plovers. "Starting in January, there will be coordinated international surveys through the United States and the Caribbean to determine exactly how many birds are left," said Tom Henson, coastal project leader for the Wildlife Resources Commission's nongame program. "Next year, we will be asking for volunteers who can identify this bird to help us with surveys. Interested Audubon chapters or bird clubs should contact us," added Henson, who will be the statewide coordinator for the plover survey next year.

Volunteers or bird clubs interested in assisting with the piping plover survey should write Tom Henson, Wildlife Biologist, Rt. 1, Box 724-B, Chocowinity, N.C. 27817 or call the Wildlife Resources Commission at (919) 733-7291.

Sites among First in Nation

Group Helps Corporations Create Wildlife Habitat

With the environment becoming of increasing concern to Americans, many corporations have gotten a black eye in the public relations arena because of business practices that destroy or reduce wildlife habitat. By joining the Wildlife Habitat Enhancement Council (WHEC), a national coalition of corporations and conservation groups, a business can improve public relations and, more important, actually help wildlife.

The council aims at physically improving wildlife habitat on corporate lands and fostering environmental awareness among company managers, employees and the local community. Founded in 1988, it boasts a membership that includes conservation heavyweights like the National Audubon Society and the National Wildlife Federation, as well as 50 other major corporations and conservation groups. As a result of the council, wildlife habitat has been improved at dozens of corporate sites around the nation.

The program helps a company decide what it wants to do with a site. It also offers technical assistance and provides contacts with private groups and public agencies. In many cases, costs for creating wildlife habitat have been minimal, with valuable work volunteered by conservation groups or company volunteers. Importantly, companies also keep their land-use options open in case they need to expand later.

One of the council's founders, E.I. Du Pont de Nemours & Co., set up pilot habitat projects in 1985 at the corporation's North Carolina sites at Kinston and Fayetteville. Previously, the sites had been mowed and landscaped in typical corporate fashion, creating a nice lawn but one devoid of any wildlife. Today, Du Pont's manicured lawns have been allowed to grow into tall grass, shrubs and food plots. A pond has been dug and stocked with fish, and bluebird and wood duck nesting boxes have been erected. The 750-acre Kinston and 2,700-acre Fayetteville sites are homes for deer, small game, songbirds and other wildlife.

Du Pont has also added its Cape Fear and Brevard corporate sites to the program, bringing almost 20,000 acres of the corporation's landholdings in North Carolina under active management. With this amount of acreage involved, benefits to wildlife are considerable. Improved public relations are an obvious benefit as well, although council members say this isn't just a marketing ploy. While Du Pont considers its program a success, other companies in the state have been slow to join the program and Du Pont is the only corporation in the state currently involved.

"Corporations own a lot of land in North Carolina that is unused," explained Richard Hargitt, manager for Du Pont's occupational health and environmental affairs at its Kinston site. "There is a tremendous opportunity for companies to do something constructive with their land when it is not in use. It offers the chance to involve employees in something that is of immense interest to many of them. It's also an opportunity to get involved with community groups like the Boy Scouts or local schools and lets young people become involved in the environment."

For more information, contact the Wildlife Habitat Enhancement Council, 1010 Wayne Ave., Suite 210, Silver Spring, MD 20910 or call (301) 588-8994.

Sweet Syrup Attracts Pests

Reader Tip Helps Hummingbirds at Feeders

Dear Editor:

We certainly enjoy reading your magazine and we would like to share an idea with your readers.

We enjoy feeding hummingbirds each summer. One of the problems we have encountered is that often, in late summer, yellow jackets rob the feeder syrup and scare the birds away from the area.

We have found that we can ease thefts by suspending a small liquid-filled container about 3 inches below the feeder. In our case, this is a yogurt carton filled with water and ¼ teaspoon of dishwashing liquid.

Since yellow jackets are erratic flyers, they are trapped in the carton of fluid. We find this a simple and effective control method. We replace the fluid when it becomes too low or full of debris.

Henry and Dolores Horstman
Seymour, Indiana

Editor's Reply: *Another tip for hummingbird fanciers is to leave your feeder out longer during the year. Many people put hummingbird feeders out in the spring and summer months as hummingbirds return from their South American wintering grounds. However, most people take them in early in the fall. By keeping your feeder out longer in the year, you may help hummingbirds — with their very high metabolisms — survive any out-of-season cold snaps, especially in the fall when nectar-producing flowers are in short supply. Keeping the feeder out longer will not prevent hummingbirds from migrating south.*

The World Turned Inside Out

Dear Editor:

The April 1990 issue of *Wildlife in North Carolina* has turned the world inside out.

The photograph on page 5 indicates that Madagascar is now on the west coast of the African continent. We have been told the Red Sea has been parted but we never knew that it has been relocated.

How can we ever explain this to our grandchildren?

M.E. Johnson
Belmont

Editor's Reply: *The world is certainly a topsy-turvy place these days, but we apologize for making it even more upside down than normal. In our lead story in the April issue, "Our Living Planet," the photograph of the Earth taken from the Apollo 17 spacecraft was unintentionally flopped. We thank our readers for the many letters that called this to our attention, and for the humor with which they did so.*

Cast Us A Line...

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit any correspondence. Please sent to Letters Dept., *Wildlife In North Carolina*, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Popular Boat Returns

Plans for Sea-Skiff 20 Available

Mention the boat known as the Sea-Skiff to just about any old-time coastal fisherman worth his salt, and you'll get an appreciative nod. Sea-Skiffs were designed and built by T.N. Simmons of Myrtle Grove Sound near Wilmington from the early 1950s until Simmons closed shop in 1972. The Sea-Skiff's low cost, combined with its excellent seaworthiness, introduced a whole generation to ocean and commercial fishing. While many of the 30-year-old wooden boats remain in service today, their production was sorely missed by many.

The Sea-Skiff, however, has returned. While you'll have to build it yourself, the plans and building directions being offered will make the task considerably easier. In 1985, the New Hanover County Museum Foundation was given plans and building directions for the 1958 Sea-Skiff 18. Since then, nearly 600 plans for this 18-footer have been sold worldwide.

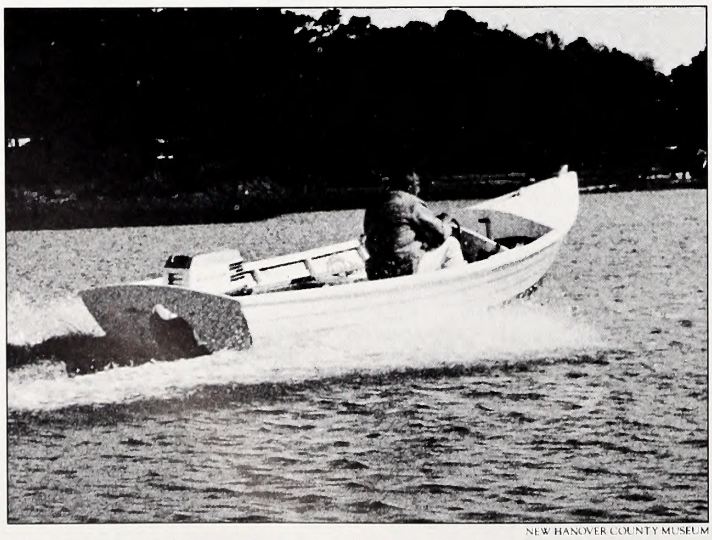
The Museum Foundation is now offering plans and building directions for the famous Sea-Skiff 20, a vessel used by the U.S. Army Corps of Engineers as its survey boat from 1971 to 1987.

Sea-Skiffs feature an upswept dory bow designed to ride over waves, a raking stern to lift ahead of following seas and a motor well to protect the outboard motor. For wooden boats, they are also light in weight due to their lapstrake plywood construction.

To obtain more information on the plans, contact the New Hanover County Museum Foundation, 814 Market St., Wilmington, NC 28401, or call (919) 341-4350.

Be A Safe Boater

The 33rd annual National Safe Boating Week will be celebrated June 3 through 9 and focuses attention on the need to observe boating regulations. For more information on boating classes and safety requirements, call 1-800-336-BOAT.



NEW HANOVER COUNTY MUSEUM

Mr. Simmons's Boat: *Plans are now available for the famous Simmons Sea-Skiff 20, a bigger version of the 18-foot Sea-Skiff pictured here. About 600 plans for the popular 18-footer have already been sold worldwide.*

Seeds Are Free

Seaside Mallow Chosen Wildflower of the Year

N.C. BOTANICAL GARDEN

Wildflower of the Year: *The bright pink flowers of the seaside mallow are sure to brighten any garden. Free seeds for this colorful native wildflower can be obtained by sending a self-addressed, stamped envelope to the North Carolina Botanical Garden.*

By planting wildflowers, gardeners have an opportunity to show off some of nature's most colorful plants in a controlled setting. Many of these native species are easy to grow from seeds and provide a better alternative to plants collected in the wild. If you want to try out your green thumb, you needn't look any further than the North Carolina Botanical Garden. For the price of a stamp, you'll get a free packet of seeds to grow the selected wildflower of the year.

In 1990, the seaside mallow (*Kostelelskya virginica*) is the wildflower of the year. A member of the mallow family, it flowers best when grown in a sunny or semi-sunny location. A profusion of hibiscus-like, five-petaled, bright pink flowers covers the plant in late summer and early fall. From the center of the flower rises a column of bright yellow anthers, a color that contrasts nicely with the pink petals. The mallow can reach a height of 6 or 7 feet in one growing season. This perennial is well-suited to a variety of growing conditions and provides a splash of color when most other perennials are past their peak.

The Wildflower of the Year Program, now in its ninth year, is a cooperative conservation project of the North Carolina Botanical Garden and the Garden Club of North Carolina Inc. To receive a free packet of seaside mallow seeds along with a descriptive brochure on how to grow this plant, send a stamped, self-addressed business envelope to: Dept. WFOY, N.C. Botanical Garden, Box 3375, Totten Center, University of North Carolina, Chapel Hill, NC 27599-3375.

— Rob Gardner

More Cases Each Year

Lyme Disease Increasing in North Carolina

Like the "ticking" of a time bomb, Lyme disease is beginning to get the serious attention of outdoorsmen in North Carolina. This tick-borne disease — close to epidemic proportions in the Northeast — is expected to become more common in North Carolina as well.

Like Rocky Mountain spotted fever, Lyme disease is caused by a bacterium transmitted through a tick bite. Lyme disease has surpassed Rocky Mountain spotted fever as the most common tick-borne disease in the United States, although there are still more cases of spotted fever reported in North Carolina than Lyme disease. It is a debilitating illness that can cause damage to the heart and nervous system, as well as crippling arthritis in the major joints of the body, if left untreated. Lyme disease has been reported statewide.

In the Northeast, the pinhead-sized deer tick *(Ixodes dammini)* has been found to transmit the disease. Entomologists and disease specialists in the state are perplexed because the vector — or primary transmitter — for the disease has not been identified in North Carolina or the Southeast yet. However, available evidence points to Lyme-infected Lone Star *(Amblyomma americanum)* and black-legged *(Ixodes scapularis)* ticks, both of which are common in the state.

Just because you are bitten by a tick, however, does not mean you will get the disease. In North Carolina, less than one tick in a thousand is currently infected with Lyme, so the chances for infection are still remote. Last year, there were about 60 cases reported, up from 19 reported cases in 1988. Because the disease is often misdiagnosed, there may have been additional cases, disease specialists say.

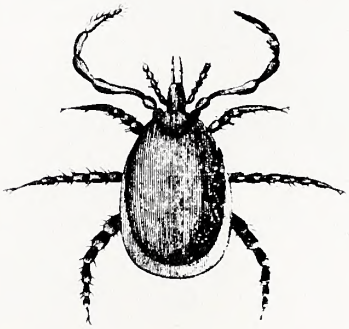
While still uncommon, the increasing occurrence of Lyme disease should be noted, say experts. "The disease is definitely increasing in the state," said Charles Apperson, a professor and entomologist at North Carolina State University. "We don't have an explosion of cases as they do in the Northeast, but the trend is for more cases in North Carolina."

Although infected ticks are active from early spring to fall, the incidence of Lyme disease peaks in July, with the majority of cases reported from May to August. The spirochete *Borrelia burgdorferi* is the bacterium responsible for the disease, which is closely related to syphilis. Like syphilis, Lyme disease is known as "the great imitator" because its symptoms are so varied and similar to other diseases. Initial symptoms often — but not always — include a bright red, circular "bull's-eye" rash around the bite area. Other early warning signs that occur within two to 30 days include flu-like symptoms, low-grade fever, joint aches and pains. Even if you don't remember a tick bite but develop a bull's-eye rash, or get flu-like symptoms in the summer, see a doctor as soon as possible.

While there is no vaccine available to prevent Lyme disease, it can be successfully treated by antibiotics if diagnosed and treated early. If left untreated, the disease can be serious, with neurological or cardiac disorders such as meningitis, Bell's palsy and encephalitis possible. Severe and disabling arthritis is also common when the disease remains untreated. Advanced nerve damage can occur, with symptoms similar to Alzheimer's disease and multiple sclerosis.

For Lyme disease, the best cure is prevention. When outdoors in the summer, use bug repellents containing diethyl toluamide (DEET) and check carefully for ticks after being in the woods. An abundance of deer in an area increases the number of ticks found there and people should take special precautions where deer are plentiful.

Laboratory tests with animals have shown that an infected tick must be attached about 24 hours before the disease is transmitted. Therefore, any ticks should be removed from your body as soon as possible. Never use heat to remove the tick as this can force the tick to expel fluids into you. Rather, gently remove the tick with tweezers or tissue-covered fingers. Grasp the tick as close to the skin as possible and pull straight out, taking care not to crush it.



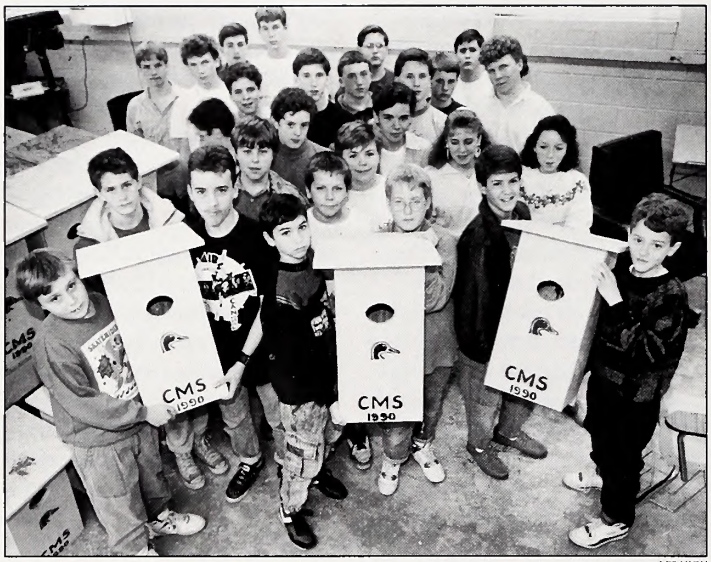
The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, NC 27604-1188.

Status on March 31, 1990

	Number Sold	Revenue Received
Lifetime Sportsman's Licenses	49,198	$18,282,918.32
Lifetime Hunting License	633	177,028.72
Lifetime Fishing License	3,794	869,189.05
Lifetime Subscriptions to *Wildlife in N.C.*	1,920	264,084.69
Contributions	—	172,318.09
Fund Total	55,544	$19,765,398.87
Total Interest Earned		$5,473,280.51

Students Build Wood Duck Boxes



LES HIGH

A Job Well Done: *Over 100 students in the technology education class at Whiteville Central Middle School helped build 40 of these splendid wood duck boxes. The project was done in conjunction with the Peal-Sigmon Ducks Unlimited chapter and the boxes will be placed in local ponds and swamps for wood duck nesting.*

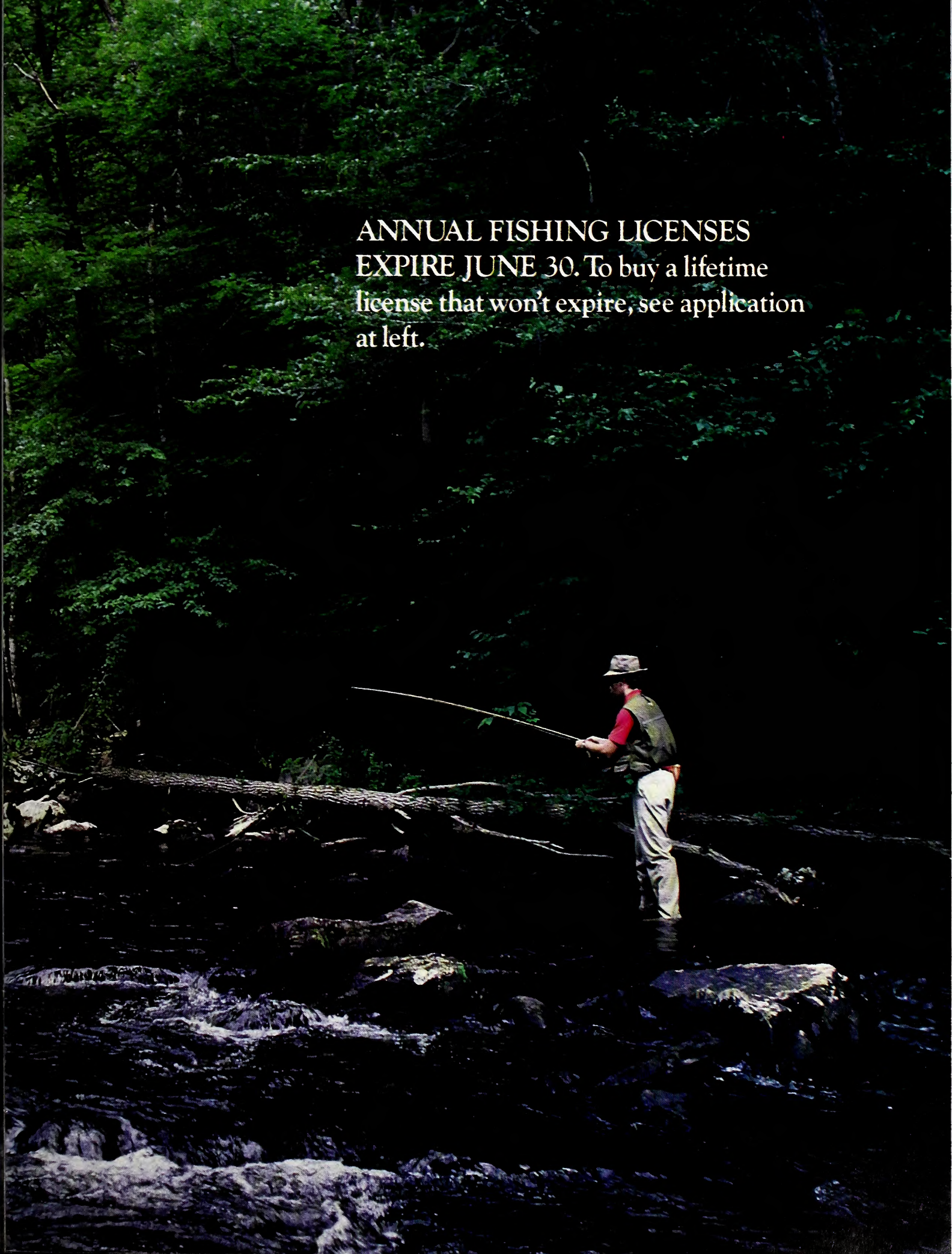
Calendar

June 4-10
National Fishing Week will be observed the week of June 4 through 10. Check your local papers for events scheduled in your area or call the N.C. Wildlife Resources Commission at 919-733-3633 for information on fishing clinics to be sponsored at selected locations.

June 17-22
The 39th annual N.C. State University Sport Fishing School at Hatteras will feature offshore fishing techniques and classroom instruction. For more information, contact N.C. State University Sport Fishing School, Box 7617, NCSU Department of Zoology, Raleigh, NC 27695-7617.

Make Certain Plastic Crates Are Legal

The "Recycling For Keeps" poster that appeared in the April issue suggests that plastic milk crates would be great around the house for holding glass bottles, plastics, paper and other items until they could be dropped off at a local recycling center. Just be sure the plastic crates you use for this purpose are the generic type sold in many stores, and not milk crates owned by a dairy. Such crates have become very popular in recent years, so much so that their theft from dairies has become a problem. This past year, a law was passed making it illegal to take or possess plastic milk crates owned by a dairy.


ANNUAL FISHING LICENSES
EXPIRE JUNE 30. To buy a lifetime
license that won't expire, see application
at left.

Moth In Bloom

For all their beauty, these apple blossoms may be eclipsed by the striking colors of this handsome *Cecropia* moth. One could almost say that moths and butterflies also begin to bloom this time of year.

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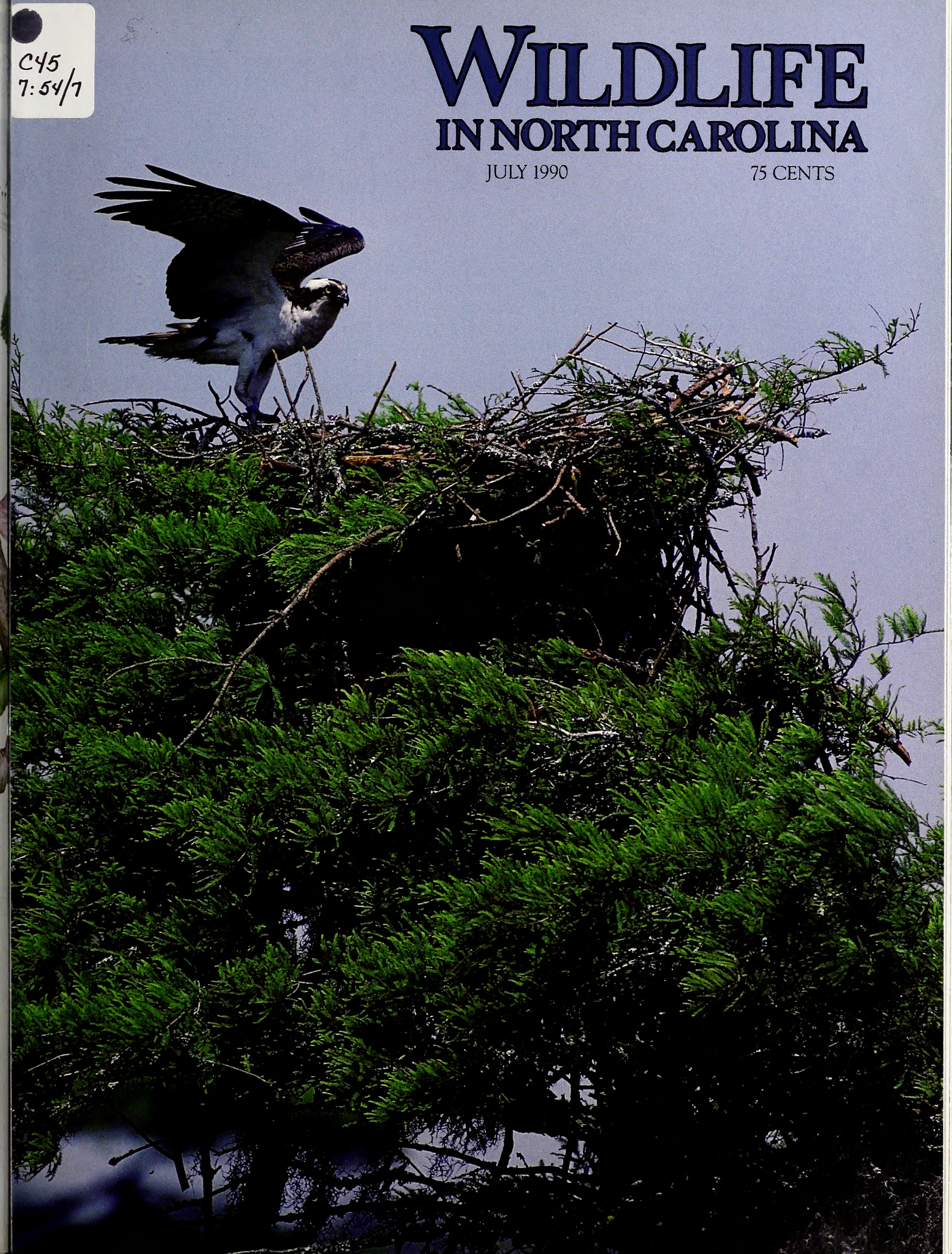

Perch Jerking And Other Pleasures

by Jim Dean

"Here, add these to all that fishing stuff you've been collecting," said W. K. Richards when I stopped by his antique mall not long ago. He handed me a couple of well-chewed wooden bass plugs, some old line and a bobber. The bobber was an unusual contraption made of red and white celluloid, and I recognized the type immediately.

"You know what this does?" I asked. "When a fish bites and makes it bob on the water, it whistles." I blew gently into the hollow tube, and it made a noise like a toy flute. "I had one just like this when I was a kid."

"No kidding," said W.K. "So it's an antique, huh?"

That old whistling bobber brought back fond memories of fishing trips with my grandfather, even though you could say that the tiny bluegills we caught were hardly worth a toot. Cane pole fishing has its charm, however, and some of us never outgrow it, or want to. It's an old saying that, "The loveliest sight in all nature is the ripple on the water where the cork was."

JIM DEAN

There are recent signs, however, that this fundamental style of angling may be changing. The venerable cane pole is being replaced by modern glass and graphite poles. One type, called a "breambuster," has become increasingly popular over the past dozen years because it telescopes, and you can keep it in the trunk of a car. Some even newer telescoping models designed originally for crappie fishermen are much longer, and they can be equipped with a small reel with a drag — a desirable feature for those occasions when you hook a particularly large or rambunctious fish. It's nice to know you can yield a little line to a slab crappie or a shellcracker as thick as a city phone directory.

Some diehard purists will no doubt cling to cane poles, partly because they are cheaper, and partly for tradition. After all, with the family sedan full of chirping crickets and a cluster of cane poles sticking out the back window, it's hard to take life too seriously.

The influence of high-tech angling is more evident among those panfishermen who use artificial lures or flies to catch bluegills, redears (shellcrackers), redbreast (robins), crappies and other panfish. Ultra-light spinning tackle is certainly one of the most exciting ways to fish for panfish. Many anglers now routinely carry an ultra-light rod and reel with 4-pound test line.

Two very recent developments have further enhanced this tackle. The highly touted long-cast spools available on some new light spinning reels truly do enable longer casts with light line. Also, some new monofilament lines are so thin that 6- and 8-pound test cast as well as the older 2- and 4-pound test. Perhaps the ideal setup is a small long-cast reel with an extra spool — one spool equipped with thin mono in 4-pound test, and a second with either 6- or 8-pound thin mono. Instead of the older very short ultra-light rods, consider a 6- to 6½-foot light graphite spinning rod.

With such a rig, you can easily cast tiny lures 1/32, 1/16 and 1/8 of an ounce on 4-pound test for panfish. If you run into some bass, you can also quickly switch spools to 8-pound test and use lures up to 1/4 ounce. For panfish, the most effective lures still seem to be small Beetle Spins or jigs. There are times when these tiny spinnerbaits and jigs will catch as many fish as crickets or other live bait.

The flyrod has been a favorite of some panfishermen for many years. Though high-priced graphite rods are superior, fiberglass rods are adequate for panfishing because long casts are seldom necessary. The biggest advance in fly-fishing for panfish probably lies in tactics. Until about a dozen years ago, very few fly fishermen cast anything but small white or yellow floating popping bugs or sponge spiders. These, of course, are deadly when bluegills are bedding or in early morning and evening during the warmer months when panfish feed on the surface.

More recently, however, more fly fishermen are using sinking flies like ants, nymphs and small streamers for panfish. This not only gives you a good chance to catch bluegills when they aren't feeding on top, it's an especially effective way to catch shellcrackers and crappies. Shellcrackers feed mostly on the bottom, and they dearly love a darkly colored sinking fly. Crappies, of course, are suckers for a small white streamer that imitates a minnow, but they'll strike most any sinking fly. A pair of sinking flies rigged in tandem about 12 inches apart is a deadly tactic throughout the spring spawning season, and right on through the summer.

If you've been overlooking panfish in recent years, now's a good time to get back to your roots. Bait, ultra-light and fly fishing — choose your weapon and have at it.

July 1990
Volume 54, Number 7

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *Ospreys have rebounded from their low numbers since DDT was banned. These avian predators are common along the wild Waccamaw River (see articles on pages 8 and 15). Photograph by Ken Taylor*

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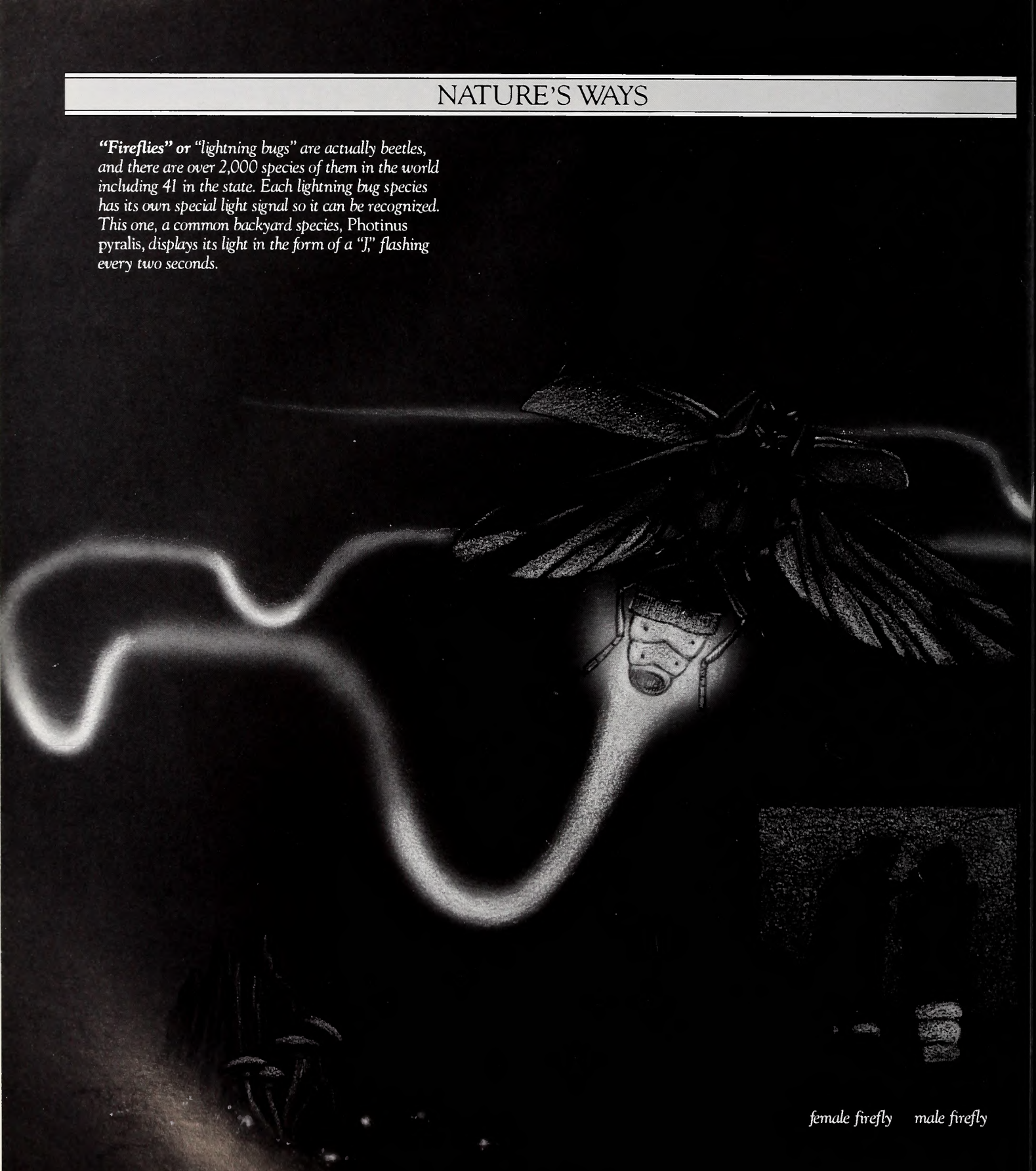
***"Fireflies" or** "lightning bugs" are actually beetles, and there are over 2,000 species of them in the world including 41 in the state. Each lightning bug species has its own special light signal so it can be recognized. This one, a common backyard species,* Photinus pyralis, *displays its light in the form of a "J," flashing every two seconds.*



female firefly *male firefly*

***The famed foxfire** that glows mysteriously in northern woods is the luminescence in decaying wood caused by the glow of the vegetative part (mycelium) of certain mushrooms.* Armillaria mellea *is the most widely distributed and best known of these mushrooms. The fruiting body is distinctive and edible but individual mycelia are difficult to see, so most people have no clue as to what gives stumps their eerie glow.*

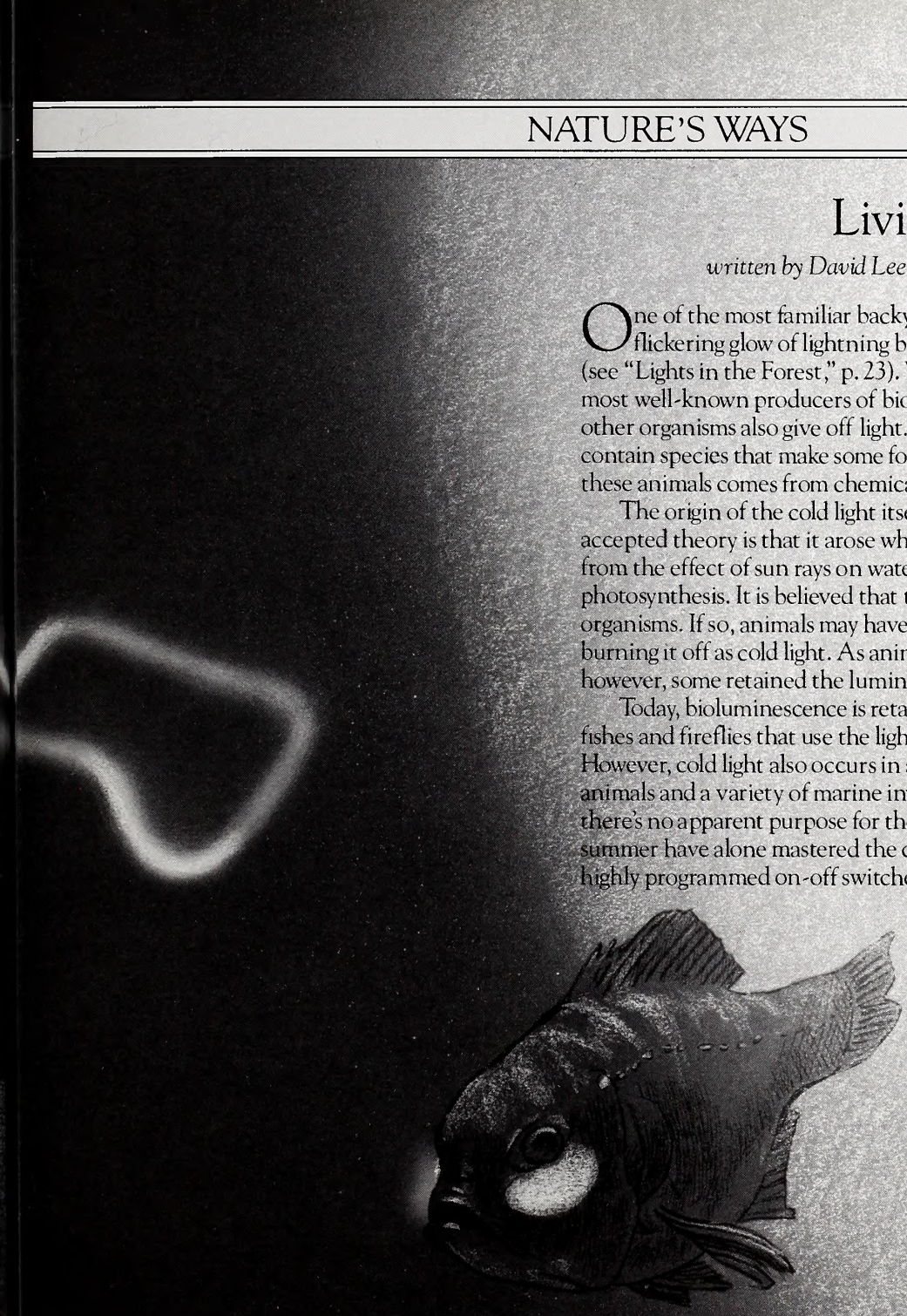
Living Light

written by David Lee/illustrated by David Williams

One of the most familiar backyard sights of summer is the soft, flickering glow of lightning bugs on their urgent business of mating (see "Lights in the Forest," p. 23). While lightning bugs are perhaps the most well-known producers of bioluminescence, or "living light," many other organisms also give off light. In fact, at least 41 orders of animals contain species that make some form of cold light. The light produced by these animals comes from chemicals and is heatless.

The origin of the cold light itself is not well understood. The generally accepted theory is that it arose when free oxygen first appeared on Earth from the effect of sun rays on water vapor and also as a by-product of photosynthesis. It is believed that this oxygen was probably toxic to some organisms. If so, animals may have originally rid their bodies of oxygen by burning it off as cold light. As animals gradually evolved to run on oxygen, however, some retained the luminescence.

Today, bioluminescence is retained mostly in animals such as deep-sea fishes and fireflies that use the light to attract food or for communication. However, cold light also occurs in some bacteria and fungi, many one-celled animals and a variety of marine invertebrates. In some of these cases, there's no apparent purpose for the light. The luminous lightning bugs of summer have alone mastered the control of bioluminescence with their highly programmed on-off switches.



The flashlight fish *lives in tropical waters. It has a light under each eye that is made from glowing specks of bacteria. The light attracts plankton that are then eaten by the fish. The fish also use their lights to communicate with other flashlight fish and to scare off predators. Groups of these fish swim together, blinking their lights, sometimes in synchrony, over 100 times a minute.*

Fireflies are not *the only beetles with lamps. The best-known are the fire beetles of tropical America. Though small and inconspicuous, they are important enemies of sugar cane pests. They have lights both on their head shield and at the base of the tail. Some species have a reddish taillight that can flash in two colors like a traffic signal. The light of fire beetles is so strong that it is possible to read a newspaper by the light of one hand-held beetle. Young girls often fasten them in their hair as ornaments.*

BLAZING BASS

Summer bass fishing can be as hot as the dog-day air temperature. Here's how.

by Mike Gaddis ©1990

The compass on the gunwale was swinging west, and just off the bow, the blunt nose of the point guarding Grassy Creek emerged from the summer haze. As the creek slipped by on the portside, I swung the boat starboard. Three miles farther, I spotted the sentinel tree on the north shore marking my first triangulation point. To the south would be the red clay bank; to the east, the granite outcrop. I steered for the spot, and the forward progress of the boat died at their intersection. Suspense was building, and I was over the edge... of a 13-foot underwater dropoff into the Roanoke River.

I had found this place in late winter when the signal on my depth finder dropped off the 11-foot lip and tumbled 13 feet over dense brush, settling momentarily on a ledge before plummeting the remaining 9 feet to the bottom of the river. It was an exciting find, though it appeared to be devoid of fish. Still, it held promise for deep summer and I knew it would attract good bass. I had fished it twice before this season, unsuccessfully. But it was a place to believe in, and I expected this sweltering early August morning to be payday.

Thirty minutes later I had boated and released seven bass, including one macho 4-pounder with exceptional aerial skills and a very formidable 6-pounder. Even then, it wasn't over. An hour later, on my seventh pass, I hit paydirt again. A heavy fish stopped a deep crank bait dead as it ricocheted off the brush on the rim of the drop and I did little more than hold my own for the first few, critical seconds. It wasn't enough. The bass bulldogged its way into the brush, snagging a hook in the cover and tearing free. Everything went limp and I was left with that pit-of-the-stomach emptiness as the plug floated slowly to the surface. But it was hard to stay depressed. This was summer bass fishing at its best, and there were other promising places to try.

The deep summer months take their toll on the bass fishing fraternity, particularly those who fish hard-pressed public reservoirs. Take a census of bass anglers on the water March to May, then see who's still fishing in August after the fish have long since abandoned the shallows. For the majority, fishing dwindles to an hour or two early and late, and bass boats sprout water skis. There are some fishermen, however, who are relentless. The unmistakable profiles of their bassing rigs will be observed on vast stretches of open water, remaining in one location for hours, or cruising the same area, giving the impression that they are lost. These are the determined anglers who have learned that summer bass fishing can be as hot as the midday air temperature.

Success on summer bass in a heavily fished reservoir begins with a sound understanding of post-spawning behavior. Once the reproductive urge is satisfied, bass resume active feeding while beginning a gradual migration to deeper water. On the way, they stop temporarily on strategic bits of cover or structure. The bigger females will not remain in shallow water long, quickly moving to or near a deep-water retreat. The migration of smaller bass to deeper water will take longer, and it is during this period that both large and small bass may be caught readily in fallen treetops near deep water, stump beds in the deeper water bordering spawning areas and on the backbones and flanks of points with good cover that break into creek channel drop-offs. Within a few weeks, as the summer solstice approaches its peak, rising water temperature, extended daylight hours and high sun angle will hasten the migration to deeper water. Then, these transitional zones become generally less productive.

After retreating to deeper water, bass tend to follow and remain close to the waterways feeding the lake. In my experience, larger bass can be found in good numbers in creeks in June and early July but have a growing affinity for the principal river channel as summer intensifies. It's probably because of the accessibility of cooler water temperatures, depth, and well-sustained currents. As they

JIM DEAN

***The top lures** for bass fishermen in hot weather are weighted plastic worms, deep-diving crankbaits and jigs with plastic tails. Crankbaits that reach depths of 15 to 30 feet are particularly effective fished over deep, prominent structure on or near a main channel.*

***During the hot-weather** doldrums of mid summer, many bass fishermen give up the chase. If you use the right tactics, however, you can continue to make good catches of bass even on the most torrid days. This largemouth took a weighted plastic worm in deep water.*

JIM DEAN

***A good depthfinder** is nearly essential for effective midsummer bass fishing on deep structure because many of the best spots are in open water and impossible to locate without sonar. Sonar that uses a liquid crystal display to show bottom features and fish is a good choice.*

travel these underwater byways, bass are attracted to feeding stops and comfort zones on or near certain structural features of the lake. By mid-June, this summertime pattern is normally well established. The key to success is finding top-flight summer structure. The characteristics of good structure are predictable. Find these and you will find bass.

The common denominator for all good hot-weather structure is an edge forming a break into deeper water. The break must be abrupt; the more dramatic, the better. This edge should also be irregular and situated on or near a major creek run or river channel. At some place on the lip and incline of the drop-off, there must be prolific cover or subordinate structure. Generally, the surface water temperature should be above 80 degrees. Water clarity should be good.

Certain features of the lake will meet these criteria. Among them are points of land that break into creek or river channels, broad shoals that terminate abruptly into deep water, underwater islands or "high spots," a fallen tree with branches extending over the edge of a drop-off, submerged bridges and the ditches of roadbeds where pre-construction rubble was piled, cemeteries, old building foundations, bridge pilings, standing timber near deep water, the confluence of two creeks and old railroad trestles. Time spent at home with a good topographical map, searching for and marking potential scouting targets, will help you gain fishing time on the water.

A quality sonar unit is indispensable for this work. Either an LCD or flasher will be satisfactory, but a state-of-the-art LCD with a full range of features is best. During scouting trips, I make it a rule to turn on the sonar upon launching and leave it on until I take the boat out. (You get "windfall" finds sometimes enroute to known spots.) Comb any area you've marked on the map with the foregoing criteria in mind. Many seemingly promising locations will be eliminated or ruled marginal this way, but search thoroughly first.

After exhausting the obvious features of a topo map, I'll spend hours randomly cruising the edge of the primary river channel, looking for subordinate structure on the edge of the drop. Such "mini-structures" have been good to me and are less generally known. It takes only a few stumps in the right place to hold a good bass. Once located, a good spot can be triangulated with landmarks and recorded with reference notes in an on-board notebook. On big, open water, Loran-C, a navigational device, can be helpful in relocating proven spots. High-quality Sonar/Loran-C combinations are now on the market.

Once a promising site has been located, you're ready to start fishing. In summer, the primary concentration of fish will be found on the most dramatically distinctive feature of the drop-off, nearest the intersection of the current flow, in a depth range of 9 to 25 feet. Heavy brush draws more bass than rock formations. There will always be one best boat position and fishing angle for a given structure. Usually, it's the position that will give you the best "feel" of the predominant cover when you retrieve your lure through it. Keep in mind that the fish will be oriented into the current.

Wind direction can also be a major factor. There's a place at Bugg's Island I have fished for years. It has produced a lot of good bass, but I have learned that fishing it on anything other than a northerly wind is a waste of time. A half-dozen other holes come to mind that are also wind-sensitive. A partial explanation may be that the optimum boat position cannot be attained and held except when the wind is from a certain direction.

If you don't catch bass the first time you fish a seemingly good place, keep trying it as summer progresses. Certain locations will be

productive in June, but not in August. Others will be slack in early summer, but good at its sag point. Never give up on a place that has the right elements. The fish will be there sometime. The wonderful thing about summer bass fishing is that a good place is likely to hold several bass. Moreover, now and then a school of nice bass will suspend just off prime structure and drift in and out on feeding forays for several hours.

A friend told me of a day like that last summer on one of the most heavily fished reservoirs in the state.

"I had fished all morning without a thing to show for it," he recalled. "It was noon, so I sat adrift, working on a sandwich and contemplating my next move. Intuitively, Bent Creek came to mind." (Not its real name; you don't expect me to violate a confidence, do you?)

"I know the place," I replied. "About 300 yards up the creek from the river channel, there's a long shoal that borders a series of loops in the creek run. The drop-off has some terrific cover!"

"That's the place, but, if you'll recall, the lip's shallow and the bottom of the run's only 20 feet. It was a little late in the year for it. Anyhow, I was off again, and I pulled into the mouth of the creek at half past twelve. Then my heart sank. You can guess why."

"Probably somebody else on it."

"You got it. Not one, mind you, but two bass rigs were worrying the drop. I started to leave but decided to pull in on a nearby point and bide my time. During the next half hour, the competition boated three bass drifting the drop-off. Then, to my amazement, they cranked up and left!

"I don't like to fish behind somebody," he said, "but I had a feeling about the place, so I lined up on the upper end of the ledge and started chunking a worm. They had fished it with the wind. I decided to work against the wind. By the time I made the end of the shoal, I had three fish of my own, including a mean 5-pounder, and had broken off a couple more. Pretty slick stuff!

"On the second pass, I added a fat 4-pounder. Things were getting slow on the worm, so the next time down I switched to a crank bait. That livened things up, and when I reached the end of the line that time, I had four more fish and two less crank baits. One of those fish pushed 7 pounds. By then, I was feelin' like the cat with the canary! I stayed there, just working back and forth, rotating lures on every trip and catching fish. It finally dried up about an hour before dark. By then I had caught 16 nice bass and lost a bunch more. Turned into one of my best days ever!"

"Those bass were schooled over the creek channel," he explained. "Every now and then, one would ease into the cover on the bank to ambush the shad, and I'd get another strike. The key was sticking tight and changing lures. Every time I'd switch, I'd start catching fish again. Fishing into the wind helped too, because it improved the lure presentation."

"It taught me a lesson," he added. "If I catch a fish or two on a good hole, I'll never leave without going back over it a few more times. There's always the chance they're school fish and there'll be more. Those boys fishing that creek could have had all those bass I caught, but they figured they had done the job and left. I think we make that mistake too often."

Because of heavy cover and the need for power and control once fish are hooked, tackle selection for summer bass favors baitcasting gear. A quality, narrow spool reel with ball-bearing drive matched to a 5½-foot, stiff graphite rod is your best bet. For jigs in the ⅜- to ½-ounce range, and deep crank baits, I also like a 6½- or 7½-foot super-magnum rod with 30-pound test mono. That line may sound a bit heavy when 12- to 20-pound test is the all-around best choice, but such specialty tackle pays off. With a full spool of the new ultra-thin line, I can match the distance of lighter lines without sacrificing strength. It's an ideal setup for deep crank baits.

Plastic worms, jigs and deep-diving crank baits are top-choice lures for deep-water bassing. Plastic worms, rigged Texas-style, can be slithered enticingly through the thickest cover and little needs to be said about their fish-catching abilities. The current generation of "action-tail" worms get the nod for their enhanced animation. Six- to 8-inch worms are my choice, but when I concentrate on big bass, I opt for 8- to 10-inch worms. Crawdad, Moccasin, Blue Shad and Grape Shad have been particularly good colors for me. I favor hooks in 3/0 to 4/0 size. You get better action, and bass in pressured lakes require more finesse. Slip weights should range from ¼ to ¾ ounce. Generally, I like the feel and fall of the ½-ounce lead, but sometimes a very slow descent is better, and I have seen windy days when ¾ ounce was barely enough and didn't seem to deter strikes at all.

Jigs ¼ to ½ ounce, rigged with a pork chunk or plastic appendage, are a great change-up strategy. When plastic worms or crank baits are fished in dense brush on undercut banks, bass will often grab the lure, take advantage of slack line and run back into the cover. Once there, they often wrap up and break off or tear free. The percentage of fish landed can be improved sometimes by aligning the boat directly over the drop and bouncing a jig vertically through the cover on a tight line. This is where the super-magnum rod will earn its keep. When a bass is hooked, put on the pressure and "haul hawg" until the fish is free and under control. A bow-mounted depth finder and trolling motor with the transducer on the trolling motor shaft are almost necessities for this tactic and will generally improve your ability to maintain optimum boat position on any deep-water structure.

I carry a lot of deep-diving crank baits, a measure of my faith in them. Baits like Mann's 15+ and 20+, Rebel's Deep V-R and Bomber's Long "A" are not misrepresented, as many deep divers have been. On a long cast, they will easily reach the depths claimed, the optimum range for summer bass, and they don't require constant fine tuning. They stay down there gnawing the bottom and worrying the cover and are remarkably durable for the beating they take. Working a deep crank bait parallel to the edge of the drop keeps it in potentially productive water all the way. Use long casts and keep retrieves moderate to fast. The lure needs to be constantly scratching stumps or careening off cover. Occasionally, when it hits something, stop it dead and let it free-float a second or two. Fish will often hit on the pause. I think a lot of strikes are reflex hits. That's good, because it gives me a chance when the fish aren't actually feeding. There have been many times in the past two years when the deep crank baits have outfished plastic worms for me. I'm impressed with that!

CURTIS WOOTEN

***Hot-weather** bass fishing on big lakes is like a treasure hunt because there are seldom visible signs of a good spot. Though these fishermen may seem to be sitting in nonproductive, open water, chances are they've used sonar to locate a potential bass haven in the depths.*

Summer bass fishing is a real treasure hunt. A good map and a few clues, and the search is on. Success, in progressive degrees, is predictable and addictive. You keep looking for the Mother Lode. Then you get a day like the one my friend had on Bent Creek, and all the effort pays off.

Then, you can crank up that outboard and contentedly cool your heels all the way in. ⊠

Mysteries of THE WACCAMAW

Traveling the meandering Waccamaw River, explorers may encounter hundreds of white ibis feeding in a swamp amid the stumps of giant cypress. What's next, they may ask... ivorybills?

by Lawrence S. Earley

The disagreement is about white ibis, but somehow it seems larger than the big white birds with crooked bills. Call it a dispute over swamp metaphysics.

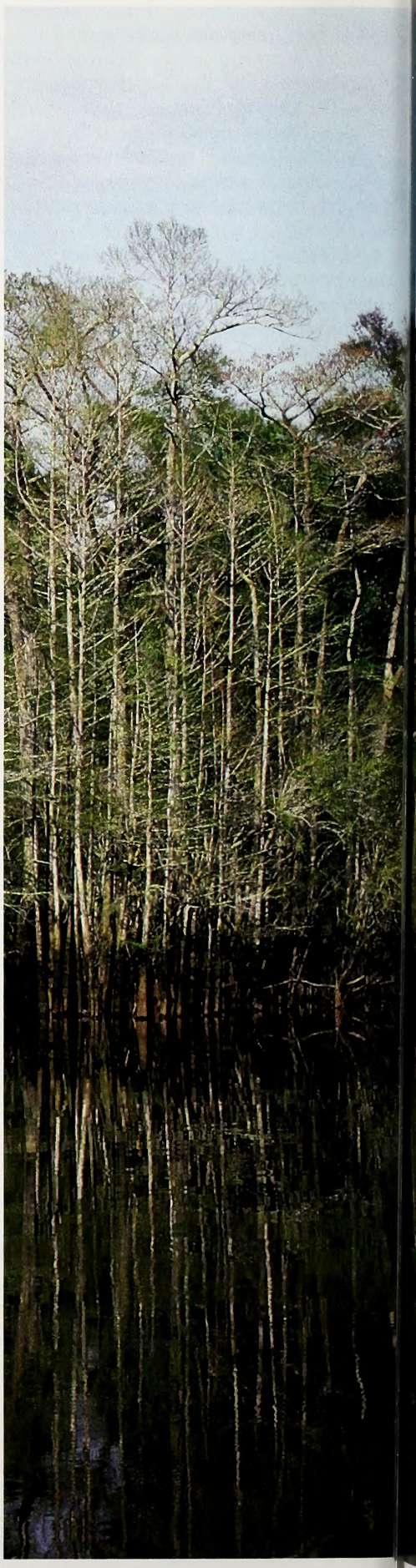
"Them damn white birds you seen along the river, they the wussest thing we ever had down here," Tommy Spivey says, throwing down the gauntlet. Ibis nest in colonies on open coastal islands, yet in early spring, before the nesting season, hundreds of them sometimes feed and build their strength along the upper Waccamaw River, in some of the deepest swamp left in North Carolina. Tommy's from Crusoe Island, the legendary community in the heart of the swamp, and he knows the swamp and its creatures better than most people know their backyards. His opinion is worth something.

"They will eat ever'thing that crawls," he continues. "Ever' leaf on the ground they will turn over and eat what's underneath. The little redfin pikes and catfish ain't got no chance. Those birds'll eat 'em all up."

Now, I'm the tourist here and I come at ibis from a different angle. I've heard that they don't eat little fish at all, that they're really after crayfish, but that's not the point. I just can't stop thinking about the way I saw ibis the first time, from a canoe, along the Waccamaw, a river I didn't know. They were white shapes in the black sloughs on both sides of the river, and at first I didn't know what they were. Were they egrets? We paddled closer, until their curved, red bills gave them away. Ibis! We put up our paddles and let the current take the canoe. There were hundreds of the birds spaced throughout the swamp. Hundreds more sat in the trees overhead, croaking and jabbering nervously as they eyed the alien presence floating below.

Sensing danger, a great phalanx of the birds suddenly rose from the swamp and in a minute the entire flock was in the air, confusedly wheeling and plunging in a swamp hoedown. The thunder of their wings, their excited croaking, the white of their bodies against the shadowy trunks of the gums and cypress, the exotic look of their livid and crooked beaks — it could have been a scene out of some primeval swamp of 10,000 years ago. And here's the thing — I had the feeling that if we just waited there, our senses fully alerted, we'd have seen a big black bird with a white bill silently fly to an ancient bald cypress tree — an ivory-billed woodpecker! Or a flock of yellow-and-green Carolina parakeets would flit by. Or perhaps we'd hear a panther's scream, sounding like a

JAMES F. PARNELL



LAWRENCE S. EARLEY

Near Reeve's Ferry, *the Waccamaw is wide and has high, sandy banks (right). In the river's headwater swamps, however, the narrow channel can disappear when the water is high. A white ibis feeds on crayfish along the headwaters of the Waccamaw (left). Large flocks of these exotic-looking birds stage along the river before the nesting season.*

woman in terror, or the wild howl of a red wolf.

Okay, I've got a vivid imagination, I admit it. These are animals that are gone forever from the Waccamaw, gone from all the great cypress swamps of the South, extinct long ago.

Yet, as I watched the ibis disappear downriver, they seemed not so much birds interrupted in their feeding as totems, guardian spirits of the swamp keeping watch over this remnant. Anything seemed possible in these dense headwater swamps of the Waccamaw River. Even ivorybills.

KEN TAYLOR

***Crusoe Island** boat builders carve their distinctive canoes by hand from cypress logs. Almost surrounded by water, the islanders fashioned a boat that was easy to paddle with one hand and could thread the narrow swamp channels. Today the tradition of boat building has fallen off as islanders take jobs in surrounding communities.*

KEN TAYLOR

***Decaying stumps are** all that remain of huge bald cypress trees that grew thickly in the swamp forests along the Waccamaw. Cypress makes weather-resistant shingles and rot-resistant timber and is one of the most valuable trees in the Southeast. By the early 1920s, most of the Waccamaw's old-growth cypress had been logged out.*

Swamp Meanders

My companions and I put our canoe in the river by the dam at Lake Waccamaw, the river's source. From here the river begins its seaward journey of 120 miles through Columbus and Brunswick counties and on into South Carolina, where it joins the Pee Dee above Georgetown and eventually empties its dark waters into Winyah Bay.

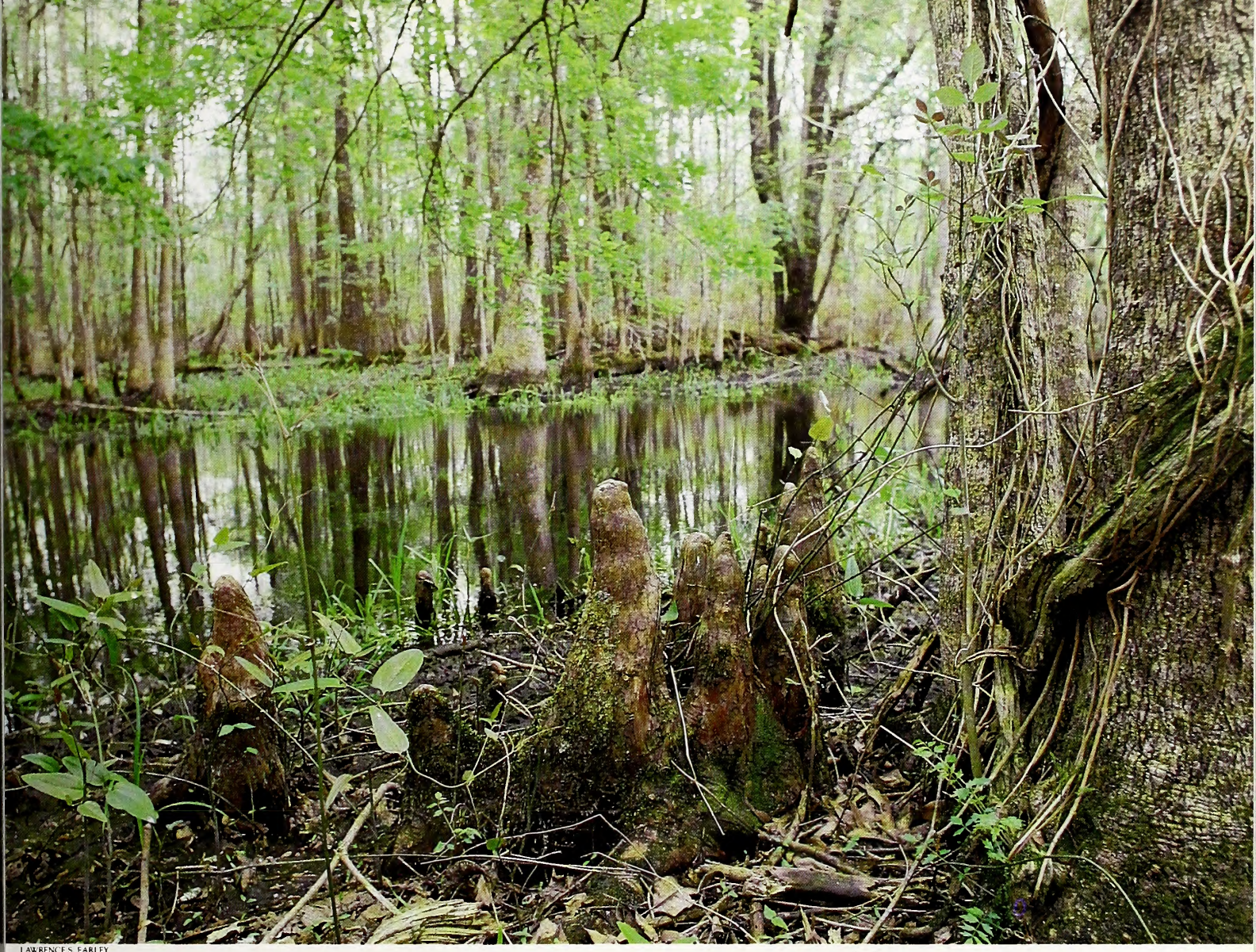
Dark waters, indeed. If you've never been on one of our Coastal Plain's blackwater rivers, you have to realize that the water is not really black; normally it's got a subtle, warm color that looks like tea against a sandy bottom, a color that comes from the tannins that leach into the water from rotting vegetation in the swamp. But on this cold March day, the Waccamaw looks like the most baleful brew of black coffee that you can imagine.

The upper portion of the river — over 10 miles in length — is flanked by vast, trackless swamps. Bogue Swamp hugs the western side of the lake, and accompanying the western portion of the river for several miles is White Marsh, a place that even natives avoid except on clear nights when they can navigate by the stars. Along the eastern portion of the river is the once formidable Green Swamp, now mostly ditched and drained and growing plantation pines. In the wet season, the upper river is more like a lake, spilling out for miles across its incredibly wide floodplain.

My companions on the trip are Becky Marty and Mike Schafale, who, along with Harry LeGrand, spent from 1985 to 1987 surveying the Waccamaw River for the state's Natural Heritage Program. The three of us are in a single canoe, which makes things kind of cozy, but it helps when I want to ask questions, which is something I do frequently. As we discuss this strange river and its unusual communities, we're not looking where we're going and we end up cheerfully banging into branches, amiably impaling logs and otherwise having a fine time. We whoop at every kingfisher we kick up, but there are so many that after a while we don't even point them out. They seem to have sorted themselves out into two lanes, one for those we chase downstream, and the other for the ones on the return trip. We're on an avian autobahn.

"People knew the river was really unique because of the rare plant and animal species that kept showing up," says Becky, "but no one had done a thorough study of the river basin before. There just seemed to be so many unusual things going on."

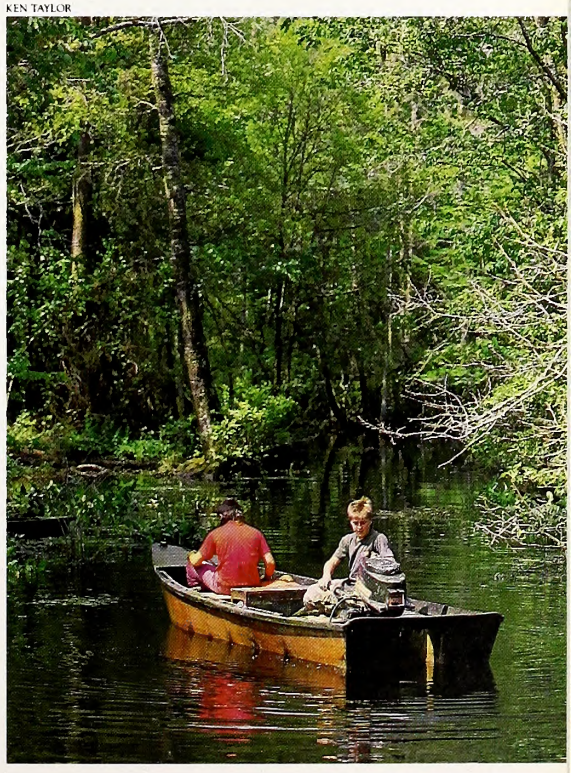
Take the wildlife, for instance. Among the birds, herons and egrets are common. Anhingas have been seen, and an assortment of songbirds such as the common prothonotary and parula warblers and the uncommon Swainson's and black-throated green warblers offer a birdwatcher plenty of excitement. Black bears patrol the river along its entire length and alligators prowl the upper 10 miles of the river.



LAWRENCE S. EARLEY

Down from Lake Waccamaw, *the river is narrow and full of meanders. Oxygen-ferrying cypress knees (above) rise above the water along the floodplain. In the swamp maze (right) fishermen can lose their way.*

KEN TAYLOR



And we've heard so many stories about snakes that we try to keep our eyes on every low-hanging branch.

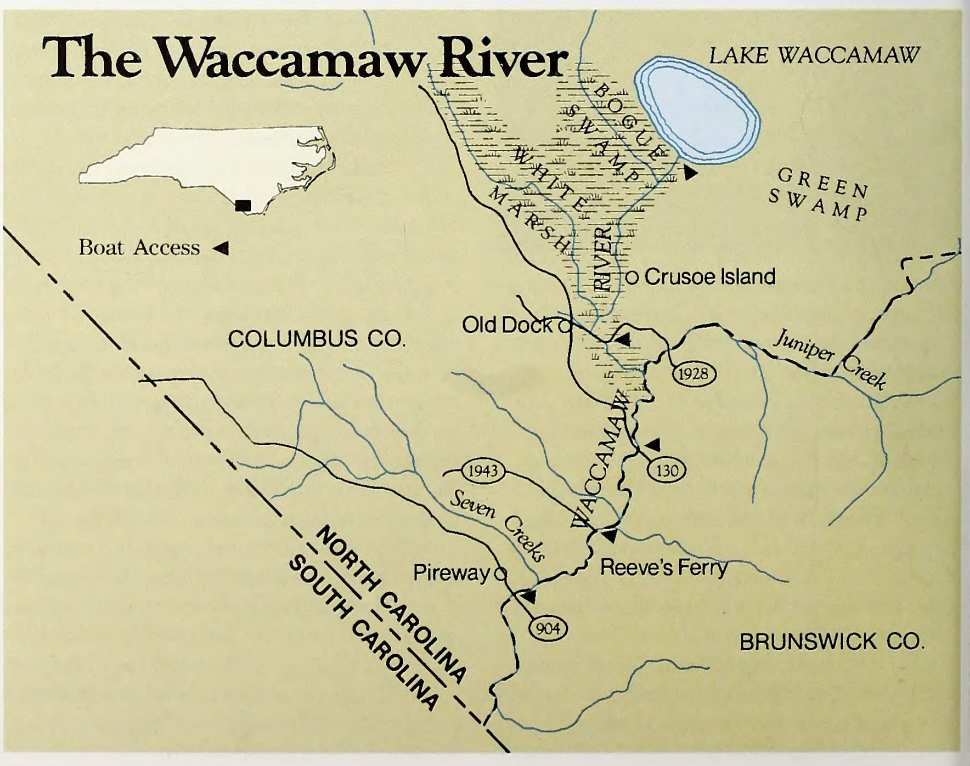
But of all the wildlife in the Waccamaw River basin, none is as unique, or as well studied, as the fish and mollusks. Indeed, biologists report that the river basin may have the most diverse fish fauna of any river in the central Atlantic Coastal Plain. Approximately 62 species have been found to date, including such game species as redfin and chain pickerel, largemouth bass, warmouth, redbreast sunfish and bluegills. The lake is said to have the highest incidence of endemic fish of any lake in eastern North America. The Waccamaw darter and the Waccamaw silversides occur nowhere else in the world, and the Waccamaw killifish has only been found elsewhere in Lake Phelps. And biologists have identified four species of mollusks that occur nowhere else. This degree of endemism is a statistical oddity that stumps scientists.

"One of the real significant things about the upper river swamp in general is the animal diversity," says Mike. "Its main selling point is that it's big, big enough for things like bears to hide in. The forests aren't really that old."

The sheer breadth of the swamp forests of the upper Waccamaw River resisted most efforts to exploit them until well into the 19th century. (They resisted settlement as well. Even today only a few communities have managed to carve a niche for themselves along the river.) There was always a market for cypress shingles and cypress logs, however. Beginning in the 18th century, shingles and logs were rafted to Conway, South Carolina, a trip that might take anywhere from five days to a month. It was a long haul. Finally an east-west railroad was constructed from Wilmington to Fair Bluff and beyond in the 1850s, and when a spur line was built to a pier on Lake Waccamaw, shingles could be carted from the swamp, floated across the lake and shipped overland.

LAWRENCE S. EARLEY

Canoers explore *a pretty cove in high water along the Waccamaw near Pireway. Water levels in the river rise fast and linger because of freshwater inputs from canals and drainage ditches.*



"Whoa! Look at this granddaddy," I say, pointing to a giant cypress stump on the left, its buttresses swelling to grip the unstable muck. We see a notch, cut into the stump, that would have held a plank to support loggers while they cut the tree with crosscut saws. It wasn't until the early years of the 20th century that the great cypress trees were systematically logged. Older residents of Lake Waccamaw can still recall seeing smoke above the trees and hearing the skidders and the tram engines in the swamps across the lake as the loggers pulled the trees out. Eventually, the loggers departed, leaving behind a mostly tupelo gum forest, with giant stumps throughout the swamp suggesting the number and great size of the bald cypress trees that had been present.

A light rain is falling now, and we pull out our slickers. From time to time we're silent as we take in the swamp sights and negotiate the quick bends. It's a crooked river, I'm finding.

Becky and Mike's survey identified 12 riverine sites containing a variety of plant communities meriting attention and, possibly, protection. They ranged from sandy islands in Bogue Swamp ("Snakiest place we've ever been," says Becky) to a unique savanna in the lower portion of the river containing no fewer than six rare plant species, including the endangered Carolina grass-of-Parnassus (*Parnassia caroliniana*) and the rough-leafed loosestrife (*Lysimachia asperulaefolia*). They found 11 rare plant species in all. Because of the unusual geology of the river and its rare plants and animals, they suggested that two preserves be established, one nearly 10 miles long on the upper river, and the other several hundred acres along the lower river.

"The main reason for the two preserves is that they encompass the outstanding and unique plant communities along the river basin," says Becky. "Also, they contain the majority of the endangered species, so if the preserves could be established they would help protect these species." In 1987, the N.C. Nature Conservancy bought a 900-acre tract of the river's headwater swamps and then sold it to the state to add to Lake Waccamaw State Park.

The river has been twisting in tight meanders, but suddenly it opens wide and continues straight. We've reached an area known locally as "The Fishponds." One of the unusual things about the river is the unpredictable way it narrows and broadens. Beyond The Fishponds, the river closes down and begins its meandering once again. The sound of a rooster crowing announces high land and pretty soon, on the left bank, we see a little creek that leads to a landing littered with boats — Crusoe Island.

Crusoe Island grew up on a high ridge nearly surrounded by the Waccamaw River and one of its major tributaries, Juniper Creek. This island effect insulated it from the world for a century or more. Because no one knows how or when the inhabitants arrived on Crusoe — some have claimed they were survivors of the Lost Colony — the island "is shrouded in legend and mystery," says historian Wilson Angley. The islanders are especially known for their dugout canoes, which they build out of cypress, a tradition that arose long ago out of need. They can thread their tippy dugout canoes through the swamp maze, shoot a deer and carry it home dry with hardly an inch of freeboard showing.

According to Tommy Spivey, a lifelong island resident, boat builder and snake collector, these boats make sense for swamp navigation. "I been making those boats for about 20 years," he said. "They paddle better in swift water, and the wind don't blow you around as bad when you're fishing."

Things are getting messy on the river after we pass Crusoe. Not only is it raining harder, but we are losing light fast. The bottom of the canoe is awash with rainwater and river flotsam. We are paddling hard to reach our take-out at the Old Dock bridge. But, of course, just above Old Dock the river narrows again and we are subjected to an interminable series of tight meanders that test my meager skills as a stern paddler. I'm learning to keep the bow pointed into the turn and then to pull hard to keep the stern from drifting out into the quick current. It's an exhilarating and exhausting section of the river.

Then, just as the last bit of light drains from the swamp, we break into the open and see the bridge ahead. It's still raining hard as we take out.

KEN TAYLOR

FRED W. ANNAND

***Fishing is popular** on the Waccamaw (above) and on weekends the lower river is often crowded with boats. The river has one of the most diverse fish populations of any river in the state, including such popular game species as pickerel, largemouth bass, robin and bluegill. At right, grass of parnassus* (Parnassia caroliniana) *is one of a number of endangered plant species that grow in habitats bordering the Waccamaw.*

On to Pireway

In 1875, a canoeist named Nathaniel Bishop rode the Waccamaw down to his nightfall at Old Dock. Of course his trip was a little more ambitious than my own: it was only the first leg of a journey that would take him down the length of the Waccamaw all the way to Winyah Bay. And even that formidable canoe trip represented only a chip off his ultimate ambition, to canoe contiguous rivers from Ontario to the Gulf of Mexico, 2,500 miles in all. He succeeded and wrote a book about his

adventures called *The Voyage of the Paper Canoe.*

The Waccamaw was his first exposure to the blackwater rivers of the southern Coastal Plain, and he was plainly impressed with the South's alien swampscapes.

> *Down the tortuous, black, rolling current went the paper canoe, with a giant forest covering the great swamp and screening me from the light of the day. ... Festoons of gray Spanish moss hung from the weird limbs of monster trees, giving a funereal aspect to the gloomy forest, while the owls hooted as though it were night.*

It didn't take him long to note the river's meanders: several years later he still remembered the Waccamaw as "that most crooked of rivers." When he put in at Old Dock, after his first day on the river, his host, a turpentiner named Hall, warned him about the twists and turns ahead of him and advised him not to look for a shortcut. "Beware of the cutoffs," he said. "Only the crackers and shinglemakers know them. If you followed them, they would save you many a mile, but every opening through the swamp is not a cutoff." "If you take to the cutoffs," he added, "you may get into passages that will lead you off into the swamps and into interior bayous, from which you will never emerge. Men have starved to death in such places."

Thanks a bunch, fella! Despite such an ominous bon voyage, Bishop made it without incident, although he worried all the way. "The thought of what I should do in this landless region if my frail shell, in its rapid flight to the sea, happened to be pierced by a snag was, to say the least, not a comforting one."

One thing that might have comforted him was that not much past Old Dock, the river begins to develop higher banks, so that soon, no doubt, he began to see longleaf pine swaying in the distance. If he needed to, he could have pulled his boat up and repaired it in a turpentine orchard.

Indeed, the Waccamaw is a blackwater river with a split personality. In its upper stretches, where it empties from Lake Waccamaw, it's mostly swamp. Then below Old Dock, the river is flanked by higher banks and behind, clearly visible from the air, are relict ridges and sloughs deposited by the meanders of the ancient Waccamaw. What's puzzling about these meanders, however, is that they don't match the scale of the present river. The present river is a mere creek compared to the size of the ancient river.

Geologists call this an example of an "underfitted" river, meaning that it's small compared to its valley. Once upon a time, the Waccamaw carried a lot more water than it does today.

One bright April day, I sampled this high-banked portion of the Waccamaw with the Lumber River Canoe Club, an amiable group that ranged in age from children to a couple of wisecracking old salts. We put in at Reeve's Ferry, an old river landing where a couple of turpentine distilleries once smoked. Though the ferry is long gone, on aerial maps you can still see a faint line on the other side of the river that runs to the site, possibly the remains of a road. A rusted piece of piling in the water may be all that's left of the ferry cable supports. Bishop mentions Reeve's Ferry in 1875, and, not long after, the village had several stores, six houses and two turpentine distilleries. None of it is left, of course, and today it's a popular place for fishermen and canoeists to put their boats in.

Our destination this day is the bridge at N.C. 904. Once we are all loaded, our flotilla of canoes, kayaks and even a Fol-boat heads off downstream. The river is much wider here than it was above Old Dock and though it still meanders, the bends are on a larger scale.

BECKY MARTI

The Waccamaw twists *and bends as it meanders across its floodplain. Like other rivers of the Coastal Plain, the Waccamaw's channel has changed often through the centuries. Left behind are ridges (the old river banks) and sloughs (remnants of the old river channel) that mark the river's ancient course.*

On the high banks along this portion of the river, we begin to see a strange assortment of trees: bald cypress, Atlantic white cedar (sometimes called juniper), loblolly pines, and a variety of oaks — laurel oak, overcup oak and, surprisingly, live oak. My partner, Colin Osborne, is puzzled. "We don't have any white cedar on the Lumber, do we?" he asks trip leader Danny Isom.

"It's not there," Isom says.

The water is so high I can't pick out the little backswamps that Mike Schafale and I paddled in a couple of weeks before. On the right bank, a few miles down the river, we had walked down a logging road to a sandy ridge that contains one of the most unusual plant communities found on the river: live oak trees mixed with longleaf pine and even a few turkey oaks. The live oak, of course, usually grows up in the ocean's backyard: it's a maritime forest species and its thick, leathery leaves are protection from the corrosive salt air of the sea. Longleaf pines and turkey oaks are adapted to the deep sandy soils of the Sandhills. It's the only documented appearance of this community on an inland site. Nearby is a large pond called Halfway Lake, where loggers assembled logs in rafts to float to Conway or Georgetown.

The river is broader in this section but, unsurprisingly, the meanders are just as tight. Once, after a long bend, through the light green curtain of spring leaves I see what seem to be the colorful shirts of another band of canoeists. "Where did they come from?" I wonder. It takes me a minute to realize they're members of our group on the other side of the meander. I remember Hall's warning to Bishop, "Beware of the cutoffs," and I understand how confused a lone paddler can get.

As the river grows wider, the boat traffic has picked up. Most are fishermen jockeying the river in the handsome, outboard-powered "cedar-strip boats" that are characteristic of the river. There are other anglers on the scene: we stop once to watch an osprey squawking and uneasily flying short loops around its nest high on a dead cypress above the river. It's the only bird life I notice on the lower river.

At the mouth of Seven Springs Creek, we ask a fisherman if he's doing any good. He lifts a stringer of catfish, pickerel and bass, locally called trout. "How far does the creek go?" someone yells.

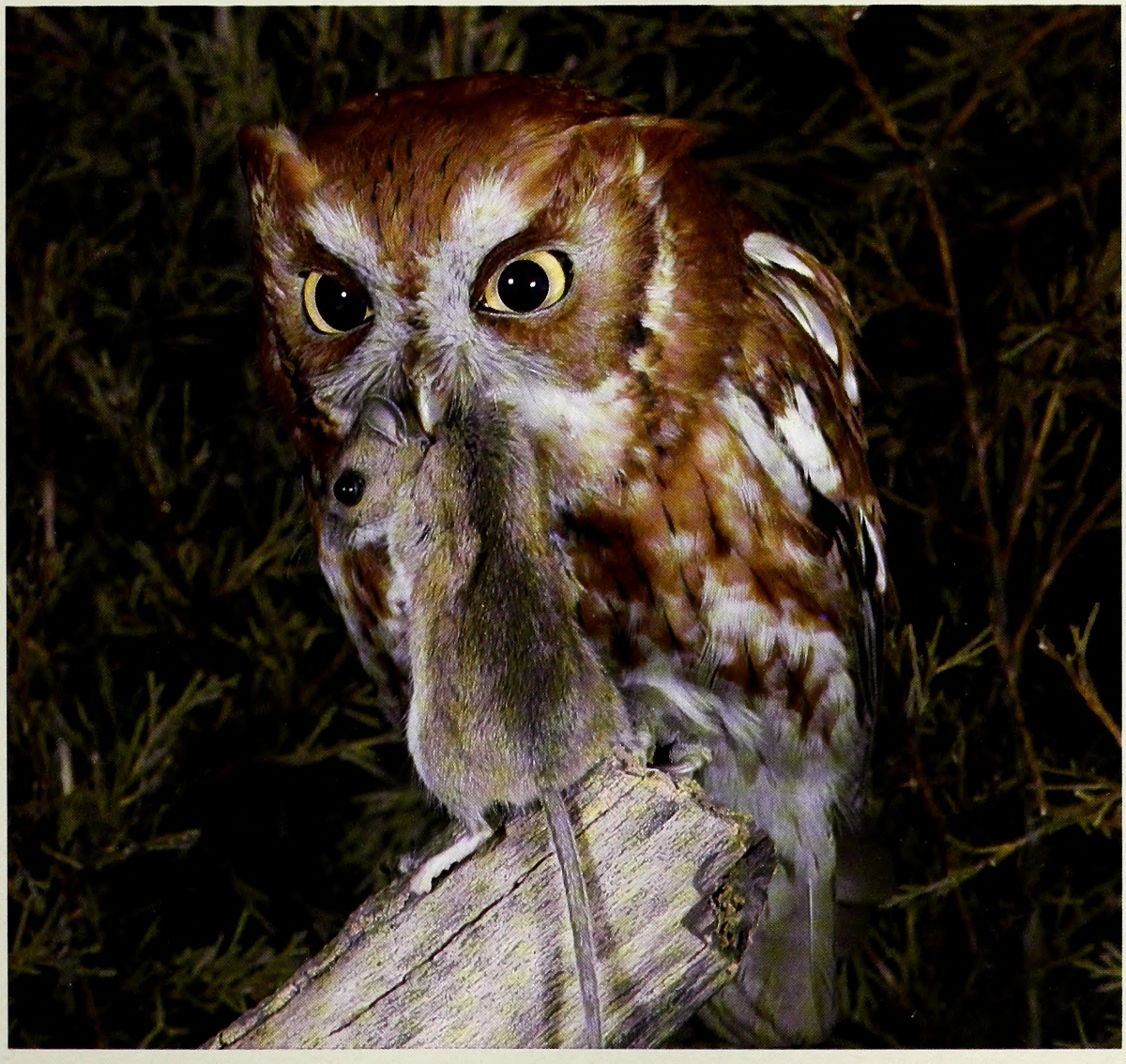
"All the way to Tabor City," the angler yells back.

We resist the lure to explore the creek on this pleasant afternoon and instead choose to eat lunch on a sandy beach just below the creek mouth. We may have been at a place, historically known as Indigo Flats, where large plantations were established before the Revolution. These plantations probably grew indigo and rice, important cash crops pioneered on large plantations on South Carolina's portion of the Waccamaw River near Georgetown.

Our takeout is Pireway, not even a mile from our lunch site, and it comes too quickly. The trip is over before I have a chance to savor the experience of canoeing a big, wide, straight river. I look hungrily downstream. "Is the rest of the river like this?" I ask Danny Isom who had canoed the Waccamaw well into South Carolina. "Well, it's nice and straight and wide like this for another couple of miles," he says, "but you know, it's weird — it gets real narrow again and starts to meander just like before and it stays that way all the way into South Carolina."

Somehow, I figured he was going to say that. ⊠

THE PREDATOR BELONGS



The many creatures that kill to live are a vital part of nature's plan. Ironically, many of the earth's gentle inhabitants that are prey for these predators could not prosper without them.

by Carl Betsill

Photography by Karl and Steve Maslowski

The Predator Belongs

Suppose that one morning before work, you are sitting at the kitchen table watching cardinals feed on sunflower seeds at your bird feeder. Suddenly you see a flash of blue feathers and the cardinals all flush. Some of the cardinals even hit the window in their panic. Then you spot the culprit. On a limb nearby you see a Cooper's hawk with one of the cardinals struggling its last in the raptor's talons. Are you horrified, or merely interested? Your reaction to the event would tell a lot about you and your ideas about wildlife.

Of all types of wildlife, predators trigger in each of us the most conflicts and misconceptions. To those who grew up with Mother Goose and fairy tales, the predators of the storybooks were something to be feared. The big bad wolf would eat you if you didn't watch out. Uncle Remus stories portray predators as sneaky, conniving thieves out to steal from the farmer. Later generations got Walt Disney's sugar-coated view of nature as a place where everything lived in harmony and peace as long as man was not around. Thumper and the fox were best buddies!

Whether these stories form our attitudes about predators or merely reflect them is debatable, but the fact is, our reaction to the incident at the bird feeder may very well fall into categories represented by Mother Goose, Uncle Remus or Walt Disney. Very few of us would take the logical, but somewhat unemotional, view that we had just witnessed two species of birds feeding at a bird feeder. The feeder had served them both. Both birds were obtaining nutrients from the sunflowers. One just evolved in a manner in which it could better obtain its sunflower nutrients in the form of cardinal meat.

Let's take a look at some of our misconceptions about predators. What do you think of when you think of predators? Grizzlies? Great white sharks? The monster from *Alien*? Most of us think big, mean and ugly. No one thinks of the ladybug, stone fly nymphs or a tiny water shrew. A farmer or small-game hunter will likely think of a hawk, owl or fox but not a largemouth bass, mockingbird or green snake.

***Hawks, owls and** eagles are probably the birds you think of when the term predator is mentioned. Yet, this eastern meadowlark feeding its young a mouthful of insects (above) is also a predator.*

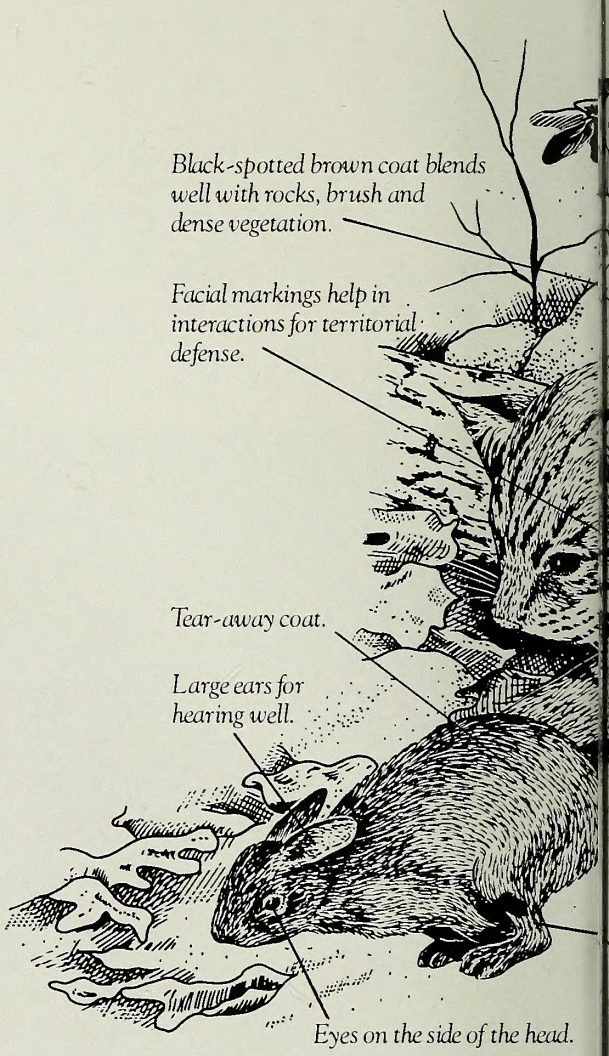
***The stealthy black** rat snake stalks a white-footed mouse because it needs to eat, not because it enjoys killing. Humans may find this southern flying squirrel (below) cute and adorable, but you can bet the* Cecropia *moth in its mouth did not. It's always a mistake to apply human personality traits to animals.*

Adaptations for Survival

If you're a bobcat, you and other bobcats haven't survived for thousands of years without a tawny coat, retractable claws and strong canine teeth. And rabbits have had good reason to appreciate large ears and strong hind legs. These features are called physical adaptations.

Bobcats and rabbits have also evolved a set of behavioral adaptations, or quite different ways of acting. The rabbit's behavioral adaptations include dashing and dodging to avoid capture. It also might freeze, holding very still to avoid initial detection by a predator. For a bobcat, solitary hunting makes catching a meal more likely. The play behavior of bobcat kittens is practice for adult hunting.

The evolution of these adaptations has helped both bobcat and rabbit successfully cope with their surroundings and aided their struggle for survival.

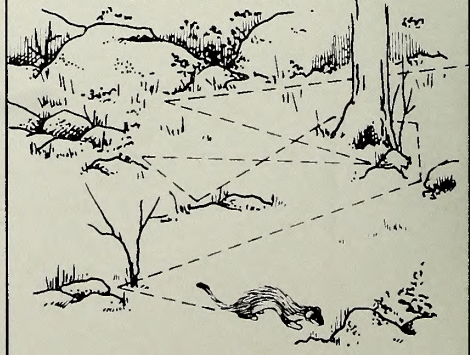


Nature provides adaptations to both predators and prey.

A red fox listens carefully for a mouse in thick groundcover.

A quick pounce may catch the hidden mouse.

The erratic hunting pattern used by a weasel helps it find any possible prey.



This also helps the weasel avoid being preyed upon by hawks or owls.

ILLUSTRATED BY CONSIE POWELL

Large canine teeth catch and hold prey.

Strong hind legs for quick takeoff.

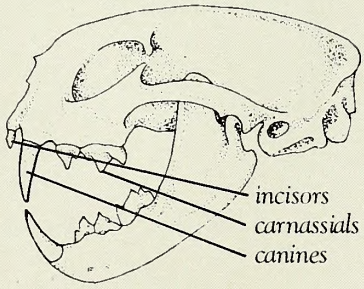
Retractable claws stay sharp to grab and hold prey.

Dental Adaptations

A cottontail rabbit has teeth adapted for eating plants.

The incisors cut the plant and the cheek teeth are shaped to grind it for swallowing.

A bobcat has teeth adapted for eating meat.

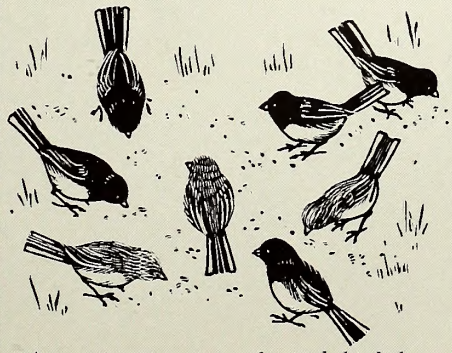


The canines catch and hold prey. The incisors are used for delicate biting. The carnassials cut meat into pieces small enough to swallow.

A newborn fawn's spots help it blend with its surroundings.

It lies absolutely still for many hours each day to avoid detection by predators.

Juncos and other birds feed in flocks.



A warning movement of a single bird alerts all the others of danger.

Many animals are countercolored like this deermouse: dark above and light below.

Seen from above, the mouse blends with the dark ground. Seen from below, it blends with the light sky.

This smallmouth bass *is grubbing in the rocks for small fish and other organisms to eat. Despite its speedy running abilities, the cottontail rabbit was unable to escape the gray fox (below). Without predators and other population controls, rabbits could rapidly overpopulate their available habitat.*

THE PREDATOR BELONGS

While we all have our preconceived ideas of what predators should look like, we run into the biggest problem when we try to apply human characteristics to them. This is called "anthropomorphism," and it was a crime punishable by public humiliation and a big fat "F" by my old college professor. You never said something like "A bobcat likes to eat rabbits." "Bobcats don't eat rabbits because they like them!" he would exclaim as you sank down in your seat. "They eat them because they are bobcats and bobcats survived because they evolved adaptations that allowed them to eat rabbits. They have little choice in the matter." He had a point. I know of no bobcats who prefer veggies.

In spite of the fact that it is totally illogical, many of us think of the predator as mean or cruel. We may even look down our noses at that disgusting hawk out our kitchen window as we, ironically, munch on a crisp piece of bacon. Somehow, if the animal is cured, packaged in plastic and cooked we don't think of ourselves as involved in a predator-prey relationship.

Because of mankind's attitude toward predators, the fox, bobcat, weasel and mink are among North Carolina predators that have commonly been shot on sight for their "evil ways." Others — such as the wolf, cougar, and maybe even the jaguar — were eliminated from North Carolina even before any studies could be made of their presence and impact.

These larger animals competed most successfully with early settlers for game and livestock, so naturally they had to go. You might think we are more enlightened today, but if you tried to reintroduce large predators into any but the most remote areas of the state, you'd stir a public uproar. The problem is not the availability of prey or even habitat; it is simply a matter of conflicts with — you guessed it — ourselves. Can you imagine the response if you introduced cougars and they began smacking their lips over poodles in a rural subdivision? If you thought a farmer in the year 1700 would have been mad about a cougar's stealing a calf, just think about a suburbanite who watched Snookums being eaten for breakfast!

You couldn't convince many people to offer Snookums to the lions. But if we understand better how the predator and the prey depend on each other, and the interesting ways nature has equipped each for survival, we might look at the situation differently. When you really

***In the hierarchy** of nature, some predators become the prey of others. The largemouth bass is a fierce predator of smaller fish, but in this case it serves as food for a hungry osprey. Note the osprey's special predatory adaptations: powerful talons for snatching fish from the water and a hooked beak for tearing flesh.*

Pieces Missing from the Predator Puzzle

Humans have been tough on predators, especially the big carnivores that roamed the state at the time of European settlement. Here are three predators that have disappeared from North Carolina, although one has been reintroduced.

Gray wolf *(Canis lupus).* Weighing as much as 175 pounds, this master predator once inhabited a vast territory throughout North America, from Alaska to Mexico. In North Carolina it roamed from the Piedmont to the mountains, feeding on deer, rodents, rabbits and other prey creatures. Wolves angered early settlers when they also preyed on livestock. North Carolina established its first wolf bounty in 1748 and the gray wolf was relentlessly trapped in pits or hunted with dogs for over a century. The last recorded gray wolf killing occurred in Haywood County in 1887. The last sighting was in 1933.

Red wolf *(Canis rufus).* This southern wolf is smaller than its gray cousin, the male weighing between 44 and 90 pounds. Shy and retiring, the red wolf was adapted to the bottomlands and wet coastal prairies of the Southeast and preyed primarily on rabbits and rodents. Not much is known about this predator. Intensive hunting and habitat destruction caused the red wolf's populations to plummet. It was threatened with extinction until the U.S. Fish and Wildlife Service began captive breeding. It long ago disappeared from North Carolina, but in 1986 a few breeding pairs were reintroduced to the Alligator River National Wildlife Refuge in Dare County, where it is hoped they will make a comeback.

Eastern cougar *(Felis concolor).* The Eastern cougar, mountain lion or panther was another large (150 to 200 pounds) predator that roamed the Southeast at the time of European settlement. It preyed on white-tailed deer but, like the gray wolf, it ran afoul of settlers when it added cattle to its diet. Cougars occupied undisturbed forest areas throughout the state but also roamed coastal swamps. One of 11 subspecies found in North America, the Eastern cougar is most likely extinct today. Sightings of cougars occasionally occur, although examinations usually reveal that the animals have either escaped or been released from captivity and are not the species native to the Southeast.

stop to think about wild animals and how they live, you quickly realize that eating and keeping from being eaten are two pretty important things in their everyday lives. Take the bobcat, for example: a bobcat has to catch a rabbit, squirrel or several mice almost every day of its life in order to survive and grow and take care of its young. If it gets sick or injured and is unable to hunt, it doesn't eat. If there are too many bobcats in the neighborhood, there are not enough rabbits, squirrels or mice to go around. The bobcat then starves, gets weak and can't hunt. It's a pretty rough life for a predator out there.

What about the prey? Talk about a rough life. Out of 100 rabbits alive in the early fall only about 20 will be around next spring. Hawks, owls, foxes, mink, bobcats, house cats and the German shepherd down the street are all looking for a meal and the rabbit is trying to avoid being the main course. And, if there are not enough predators to eat all the rabbits, what happens then? The way rabbits reproduce, there soon wouldn't be enough food and cover to go around. I've seen rabbit populations in 10-acre predator-proof enclosures that reached levels so high that nothing green was left within reach. Even the bark was eaten from small trees. The rabbits were so desperate I didn't feel safe eating a carrot within 10 miles. Clearly, it's a pretty rough life for prey out there, too.

Fortunately, nature has a way of balancing things out so animals can survive. To both predator and prey, nature provides what we call adaptations that improve the odds on their next meal. First, let's look at the bobcat's adaptations: good hearing, excellent eyesight, claws that retract so they stay sharp and clean, teeth in the front to catch and hold prey and teeth in the back that work like scissors to cut meat. These are all called physical adaptations. There are other adaptations that we can't see, but that are just as important. Territoriality is one. This is a behavioral adaptation. Behavioral adaptations help the animal survive by doing or acting in a particular way. An animal that shows territoriality is one that keeps other animals of its kind off its "property." Bobcats do this, especially when they have young. This assures that their supply of rabbits, squirrels and mice doesn't run out. This adaptation helps the bobcat survive, and also the rabbits, squirrels and mice.

And the rabbit's adaptations? Of course it has large ears to hear a bobcat approaching and eyes that can see in all directions at once, not just what is ahead. It has large strong hind legs that allow it to go from zero to 40 miles per hour faster than a Porsche. In case that's not fast enough, its skin and fur tear away like a football jersey.

Rabbits, like the bobcat, have behavioral adaptations also. Anyone who has hunted cottontails has seen rabbits run down a path only to return up the same path and take a different route. All but the best beagles will follow the original path to a dead end, giving the cottontail plenty of time to get ahead. Most remarkable of the rabbit's adaptations, however, is a reproductive rate that, unchecked, could fill every square foot of the world's surface with rabbits in less than 15 years. Plenty of rabbits left over for a few bobcats, right?

For every adaptation that makes a predator's life easier, its prey seems to counter with another that makes its life longer. The result is that both populations of animals survive and reproduce even though many individual animals of both types will die. When we think about how predator and prey live together, it's a more accurate gauge of nature's plan if we think about what is best for the populations rather than the individual. We must understand that predator-prey relationships are best for the populations of both animals, and we must appreciate the wondrous ways that nature has produced adaptations for their survival. It may be hard for us to view animals in this way, but it's the accurate way to do so, and necessary if we really want to understand how wild animals live.

In fact, even thinking of animals as populations is often not enough. In early efforts to manage populations, biologists discovered that understanding relationships between different species of animals and plants was essential in managing populations. Even this community concept of viewing wildlife overlooks the impact of non-living things in the environment — things like weather, climate, soil and water. Today biologists talk of managing an entire ecosystem, a notion that sounds rather abstract with most of us still considering wild animals as individuals.

The fact is, if we want to assure the future of any one species of animals and be able to enjoy, use and appreciate them as individuals, we must learn to view that species as a vital part of a large ecosystem. Dropping our anthropomorphic attitudes will go a long way in expanding our views towards wildlife. Pretty soon, we'll be able to say, with conviction, that predators truly belong. ⊠

The twinkle of fireflies is part of our long summer evenings, but what do we really know about these familiar insects?

Lights in the Forest

written by David Lee
photographed by James E. Lloyd

There is magic in fireflies. Their flickering signals add an element of charm to a summer's night. I can't remember a time when they did not create a sense of wonder in me. As a boy I was compelled to possess them, and in a few minutes at dusk five or ten were easily captured. Secured in a jar, they would blink through the night, softly lighting a corner of my room as they explored the jar.

Then it happened. At the age of eight I discovered free enterprise. Scientists researching the chemical source of firefly light needed specimens — lots of them. The word was out: a penny a piece for live lightning bugs. By day I scoured the neighborhood for jars. By night I was at work with a net made from a coathanger. Each week my parents drove me to Johns Hopkins University to cash in my specimens.

Quite a bit is known about chemical light today, and since all the pioneer studies were done at Johns Hopkins, I like to imagine that much of what we know was a direct result of my specimen collecting. The light produced by fireflies is manufactured without fire, heat, or electricity. In efficiency it is unequaled, with nearly 100 percent of the energy expenditure given off as light. The light (called bioluminescence) is the product of a series of chemical reactions that ends when a substance called luciferin (Latin for "light-bearing") oxidizes. All these chemicals are produced in tissues in the tail of the firefly, with supplemental air fed into the lamp through a system of microscopic ducts. An essential part of this reaction is the energy-bearing chemical adenosine triphosphate.

While the chemistry can be explained rather simply, the real magic of the firefly's lamp is how it is turned on and off

Common in North Carolina, *a male lightning bug of the species* Photinus pyralis *rests on a leaf. Forty-one different kinds of fireflies live in the state. Their flashing lights, so familiar in summer, are ways that males and females signal their availability for mating.*

Lights in the Forest

with such precision. Somehow the insect allows microblasts of oxygen to produce millisecond light pulses, but think about this the next time you watch the rhythm of their flashes. I keep expecting a meltdown. Scientists can re-light lanterns that have been severed from fireflies by injecting minute amounts of adenosine trisphosphate.

Fireflies, more often called lightning bugs, and in some countries glow-worms, are not flies, bugs or worms at all but are small flying beetles of the family *Lampyridae* (from the same Greek word that is the origin of the English word "lamp"). They are characterized by a soft, hooded shield that covers the top of the head. While some other animals also possess biologically produced light, most studies in bioluminescence have been done on fireflies because of their accessibility and abundance.

Fireflies use their blinking lamps for communication, generally of their readiness to mate. Most beetles are unable to detect sound, so for a nocturnal flying beetle that needs to locate others of its species, bioluminescence was a logical way to go. The flashes are to the firefly what a territorial song is to a woodland bird. Each species of firefly has its own signal, and in many ways these signals visually resemble bird songs I have seen reduced to images on computer screens. The flashes vary in color, intensity, duration and cadence (the intervals between flashes), allowing many species to display simultaneously and still get their visual message to members of the right species. As a slight complication, the rhythmic flashing becomes more frequent at higher temperatures. Yet, somehow these shifts in presentation are also included in the insect's basic program.

It has been suggested that the lightning bug's light may also be used to repel or startle predators. Indeed, captured fireflies usually glow when handled. Several times I have witnessed green frogs catch fireflies and to my amusement watched their ears (well, their tympanic membranes) blink and glow as they swallowed. A severed tail lamp glows for some time, as do unfortunate individuals that splat onto car windshields. In such cases the "off switch" must be broken.

The species I captured as a child was *Photinus pyralis*, a common backyard variety that actually becomes more abundant in open manicured yards than in natural areas. Even in woodlands, where this firefly is rare, it seeks open places or edges of forests in which to display. More is known about this kind than most other species. These lightning bugs fly lazily upward, pausing in midair to flash and at the same time dipping and rising in a "J" pattern. Their J-shaped flash is yellow and lasts for half a second. The time, distance and direction of movement is so exactly programmed that an astute firefly stalker can predict within inches where the insect will be on the next flash and easily capture it, even by hand. For the female firefly it is irresistible. She responds with her own unique half-second flash, roughly two seconds after the male. The male descends toward the ground below, flashes again, and again the female answers after another two-second pause. Thus, the next season's stock of blinking airborne beetles is assured.

While *Photinus pyralis* is most likely the

DAVID LEE

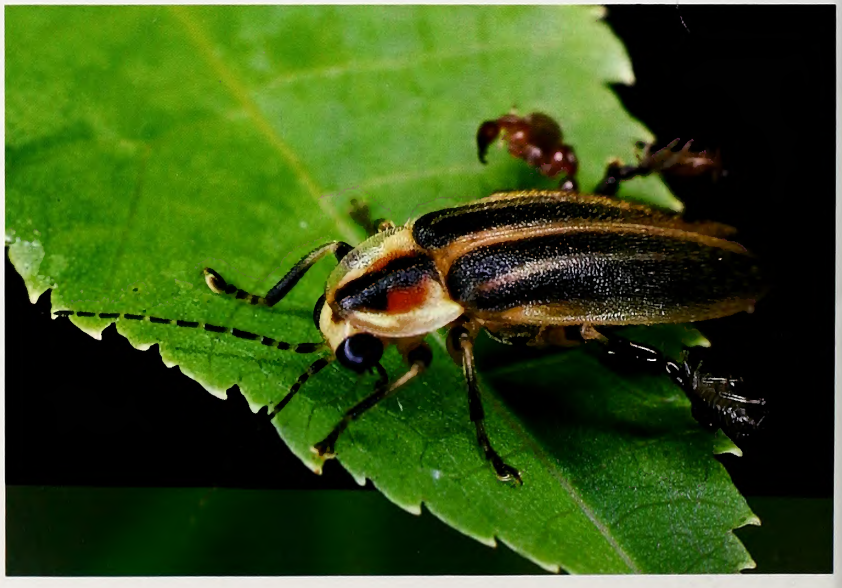
A *photographic time* *exposure captures a number of lightning bugs flashing at a similar height. Fireflies display at different heights depending on the species. The color of the flash also varies from species to species, as does the length of the interval between flashes. This interval is the primary way that members of the same species recognize each other.*

only species to be encountered in a suburban neighborhood, North Carolina's meadows and woodlands are rich in variety. No fewer than 41 species of *Lampyridae* are known from the state. A quick survey by even an untrained observer shows that there are a variety of flash colors and flash durations. The time between flashes and the distance covered varies greatly from species to species. Some give double blinks, and different species signal from different heights. One I have never been able to catch moves like a comet high in the canopy of the maples in my yard, yet others seldom flash more than 12 inches above the ground. A slightly more detailed survey of any woodlot reveals that different species' signals can be seen at different times of the night and during different seasons. The common *Photinus pyralis* is unusual in that it starts its display well before dark and is present throughout much of the summer.

With a little patience and some experimentation, male fireflies can be lured from the skies with blinks of a penlight (the small type of flashlight that comes attached to some key rings.) Since the firefly's communication blinks are quite specific, one would think the males would be hard to fool, but the competition for females is usually so intense that many males can't resist at least a passing look. Fooling male fireflies is not something that developed with the arrival of alkaline batteries. The fireflies themselves have been doing this for eons. Some female fireflies, needing good food reserves to insure a healthy production of eggs, are efficient predators of males.

Lights in the Forest

Some fireflies prey *on others by decoying them with their signals. In the photo above, a female of one species eats the male of another. She attracted him by giving the proper female response to the male's mating signal and then pounced on him when he showed up. The male at right has a couple of harmless hitchhiking pseudo-scorpions attached to his legs. Top right, this colorful* Photinus *species lives in the rain forests of Colombia, South America.*



In the genus *Photuris*, for example, females attract males of other species and then eat them. The carnivorous female *Photuris* flies to an area where lightning bug males are displaying, takes up a signaling station and then proceeds to answer with the right female response for a particular prey species. The male responds by flashing and moving closer. Competition makes the males respond quickly, but they are innately cautious. Only about 16 percent of the males attracted are actually captured and eaten by the female *Photuris*.

The problem for the male *Photuris* is to find a mate without being eaten by a population of females that are instinctively reduced to hungry imposters. *Photuris* males therefore mimic local prey species, changing their flashes to match whatever firefly is common at that location or season. When a female *Photuris* answers, he lands nearby, gives his true coded flash and hopefully changes her motives and mood.

Such complex behaviors are exceptions. Most adult fireflies don't feed at all, and those that do mostly forage on pollen and nectar. Even among the 60 or so species of *Photuris*, only a few are carnivorous mimics.

Fireflies are represented by over 2,000 named species, the majority being from the tropics. Variation is extreme and some of our most common *Lampyridae* give no light at all. They are day-flyers often found on tree trunks. The well-known glow worm of Europe does not flash or fly, it produces a steady light that attracts the winged lampless males. In most of the fireflies of the eastern United States, however, both sexes are winged and produce bioluminescence. Among our local species the female's light is smaller.

The ground-dwelling larvae and even the eggs of many of our local fireflies also glow. A walk in almost any local woodlot on a damp dark night in the early spring will reveal uncountable numbers of larval fireflies in the leaf litter. They are efficient predators. With stout, curved mandibles they inject paralyzing fluid into snails, slugs, worms and other prey much larger than themselves.

While the lantern has a clear purpose for adults, no one has explained why eggs and larvae need it. Not only does it take energy that could be better used for growth, it seems it would make them vulnerable to hungry creatures of the night. The tissues that glow in the larvae are not the ones that produce light in the adults. In fact, when the glowing parts are surgically removed from the larvae the lamp still develops in the adult.

My boyhood fascination with fireflies re-emerged about 15 years ago when I moved to North Carolina. Walking up the hill from the creek in my backyard, I was surprised to see dozens of fireflies flashing in unison. I sat on a log and watched. One male would start, by the second time it flashed two or more others would blink and by the fourth or fifth flash dozens would join in, all flashing at the same fraction of a moment as their neighbors. Individuals could be seen sputtering their lights as they clued in on the rhythm. Flash after flash, their pulse beat illuminated the contour of the hill. The whole display covered an area of nearly 100 square yards and occasionally two separate groups would join and synchronize their flashing. During the entire sequence, which often would last for a minute or more, the males were all flying more or less in a similar direction 12 to 18 inches above the ground. When a substantial number got out of sequence, all would stop, and then the entire process would start over once again.

I caught several males and the next morning had them identified by Jimmy Green, the entomologist for the N.C. Department of Agriculture. They were *Photuris frontalis*. I called Dr. James Lloyd at the University of Florida, a leading expert on firefly behavior. He made no attempt to hide his enthusiasm for the behavior I described. The following summer he visited, bringing with him an impressive assortment of equipment for monitoring firefly behavior. During his stay I learned quite a bit about fireflies. It seems the ones in my backyard and a closely related species in central Florida were the only ones in North America now known that blink in synchronous rhythms. The explanation we worked out was that they lived in such high densities that random blinking by males in close proximity would confuse the females and not elicit a response.

In the seasons that have passed since Jim's visit I have had the opportunity to test our reasoning. When summers were too wet or too dry there were fewer fireflies, and in looking around in other nearby areas I have found the highest densities over thick tangles of low honeysuckle. In areas or years of high *Photuris frontalis* density, the synchronous flash behavior persisted; in lower densities, it became less pronounced, with often only three to 10 individuals participating in a chorus. In really low densities, this species still gave its characteristic yellow light and still flew in the same pattern, but the male flashes were independent of each other.

I hate to count the summers that have passed since I bottled my first lightning bugs, or the evenings I have spent watching their yellow-green blinks and amber flickers. I hope this information on the biology of fireflies has not robbed you of the simple wonder of their coming and going, the magic of their silent cold light choruses. True, there are also a few families of ground-dwelling beetles, a California millipede, and several lesser life-forms that can also produce light — but they aren't fireflies, and they don't keep well in jars. ⊠

Firefly Fun in the Backyard

Collecting lightning bugs: Kids love to capture lightning bugs and put them in a jar. To make sure their catches don't dry out and die, place the insects in a sealed bottle without airholes. Once a day, remove the lid and blow across the top to circulate some air. A thin slice of apple in the bottle will also raise the humidity. Add a loose handful of fresh lawn grass so that the lightning bugs will have something to climb around on.

Attracting lightning bugs: Want a lightning bug to come to your hand? The male of one of the most common fireflies in North Carolina makes a flash that looks like the letter "J." When the female sees this she waits 2 seconds and gives a return flash that lasts for a half second.

Kids can use this knowledge to attract fireflies. After seeing the male flash his "J" code, position yourself in front of the male, count 2 seconds and then make a short flash with a penlight. The male will come right to the light. Females can be attracted by imitating the "J" flash of the male.

Recognizing male and female fireflies: The female's light organ is a half circle; the male's has several complete segments of yellow.

Sportsmen's Funds "Lifeblood" of Commission

License Fees Pay for Commission's Conservation Programs

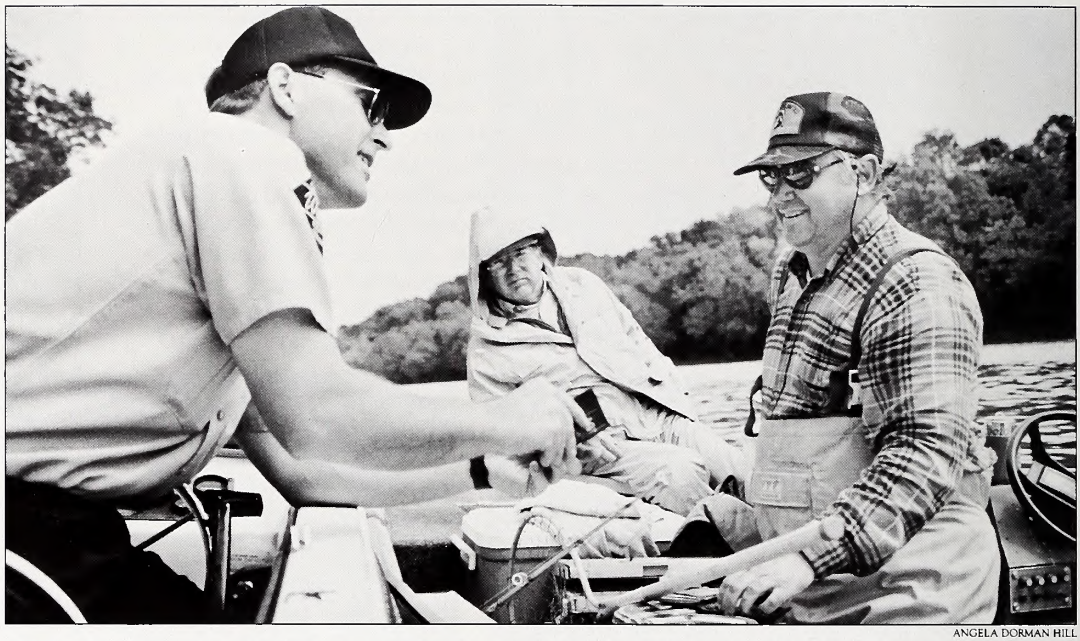
Written and Edited by Vic Venters

It's easy to take for granted the bass in your favorite reservoir, or the plentiful herds of deer in our forests. But without the millions of dollars the N.C. Wildlife Resources Commission spends each year to manage our fisheries and wildlife resources, populations of many animals would be much smaller in the face of a growing human population and the strains it places on the environment.

You are helping our wildlife when you purchase a new hunting and fishing license because that money becomes the backbone of the Wildlife Commission's management efforts in North Carolina.

In the 1988-89 fiscal year, the Wildlife Resources Commission had a budget of about $24 million. Of that amount, $12.6 million was collected from annual license fees. "The Wildlife Resources Commission derives about 52 percent of its revenues from these license fees," said Richard Hamilton, assistant director for the Commission. "License receipts are the lifeblood of the Commission because without this financial support, critical resource protection and enhancement would not exist.

"The Wildlife Resources Commission depends upon your annual license receipts to conduct its wildlife and fisheries conservation programs," Hamilton added. "A sound resource conservation program is expensive because it requires the employment of trained professional biologists and law enforcement officers who use specialized equipment such as aircraft, heavy equipment and scientific instruments."



ANGELA DORMAN HILL

All Smiles: *Not only is this fisherman smiling because he just landed a nice fish, his fishing license is in order as well. Fees derived from the sale of annual hunting and fishing licenses fund over 50 percent of the Wildlife Resources Commission's conservation programs and operations.*

Buying a license helps in other ways as well. "We received about $4.6 million, or 19 percent, of the budget in federal grants from excise taxes levied on manufacturers of hunting and fishing equipment and the federal gasoline tax for non-highway use," Hamilton said. "North Carolina's share of federal aid is determined by the number of hunting and fishing licenses sold in the state, and the land and water area of the state compared to other states."

Should you decide to purchase a lifetime hunting or fishing license, or a lifetime subscription to *Wildlife in North Carolina*, your funds will go into the Wildlife Endowment Fund. So far, the fund has raised about $18 million, and only the annual interest is used to support wildlife conservation activities. "The Wildlife Resources Commission has purchased important wildlife lands with this money and has used it in all conservation programs," Hamilton said.

Other funds are derived from various revenue-generating activities, such as timber sales, magazine sales, contributions, boat registration fees, state income tax refund checkoff, calendar, print and stamp sales. The Commission also receives about $2.5 million from the general sales tax fund each year to supplement its programs that benefit the general public.

New Rules for Buying Hunting Licenses

If you wish to purchase a hunting license next year, you'll need to fulfill one of the two following requirements. If you are a first-time hunting license buyer in North Carolina, you must have passed a certified hunting safety course and show proof of certification to the license agent. Or, if you've purchased a hunting license before, you must retain your old license to show the agent before you can buy a new one. On or after July 1, 1991, persons wishing to buy a North Carolina hunting license must show they have either passed the state's certified hunter safety course or show they owned a hunting license issued prior to July 1, 1991.

This new law, passed last year, is an addition to the state's hunting safety requirements. Hunting safety requirements for first-time hunting license buyers have resulted in a decrease in hunting fatalities and accidents in North Carolina.

Tusked Mammals Once Lived Here

Fossil Walrus Skull Found on Coast Near Cape Hatteras

Although walruses are now confined to the arctic region, fossils found in the area are proof that these massive sea mammals once plyed waters as far south as what is now the coast of North Carolina. Last winter, beachcombers near Cape Hatteras found an ancient walrus skull washed up on the beach, a clue to our area's prehistoric past.

The tourists who found the skull near Salvo last January turned their find over to park rangers at the Cape Hatteras National Seashore. The skull was then sent to the Smithsonian Institution where it has been analyzed and preserved.

"It is really nice," said Dave Bohaska, a paleobiologist and museum specialist for the Smithsonian Institution. "The skull was largely intact except for missing its tusks. There have probably been fewer than a dozen good specimens found over the past century and this was a very rare find."

Although Bohaska declined to speculate on its exact age, he said the skull dated from the Ice Age or Pleistocene Epoch, putting the fossil somewhere between 10,000 to 1.6 million years old. The skull, which is about 12 inches long and weighs about 15 pounds, is identical to that of the modern species of walrus.

Today, there are three subspecies found in the world's oceans, all in the far North. In the Atlantic, walruses are rarely found south of Labrador. The prehistoric walruses off our coast probably retreated northward to colder waters as the Pleistocene Epoch came to an end and the glaciers began to recede.

Bohaska said the skull was undergoing preservation treatment in chemical solutions because it began deteriorating upon drying out after washing up from the ocean floor. "If someone ever finds anything like this, be sure to keep it wet or put it in fresh water," he advised. While the original skull will remain at the Smithsonian, North Carolinians should be able to view a replica of the skull closer to home sometime in the future. "Castings will be made of the skull and at least one of the castings will come to North Carolina, where it can be displayed."

MICHAEL HALMINSKI

Ice Age Artifact: *This fossilized walrus skull was found on a North Carolina beach last winter and sent to the Smithsonian Institution in Washington, D.C. The skull is mostly intact except for its two tusks, the stumps of which can be seen on the lower right-hand side of the skull. During the Ice Age, walruses lived as far south as our state's coast.*

Fish Probably Came from Virginia

Wayward Walleye Caught in Chowan River

Think about fishing for walleye, and what locations come to mind? Deep mountain reservoirs and cool flowing rivers are the most likely locales.

That's why one herring fisherman on eastern North Carolina's Chowan River near Winton did a double take when he pulled a 6-pound, 5-ounce walleye from his pound net. The surprised fisherman called Wildlife Commission enforcement officers when he couldn't identify the fish.

"The Chowan River where the walleye was caught has cypress trees and warm water," said Sgt. Chester Simms, an area sergeant for District 1. "It seemed completely out of its normal range."

While the wayward walleye was a big surprise, it apparently is not a first in the Chowan. "There have been other walleye taken out of there by hook-and-line fisherman," said Pete Kornegay, fisheries biologist for the coastal region. "This is the biggest I've seen, though."

Kornegay believes the walleye migrated downstream from the Nottoway River, a Virginia tributary to the Chowan that has been stocked with walleye. He also said that smallmouth bass, another cool-water species, are sometimes pulled from deep holes in the upper reaches of the Chowan River near the Virginia state line. "Apparently the water in these holes stays cool enough for these species."

While a stocked fish from Virginia seems the most likely source for Chowan River walleye, there could be another explanation. "There used to be a natural run of walleye in Albemarle Sound," Kornegay said. "People called them 'sea pike' and they would run up the Roanoke River. There is a possibility it could be a remnant fish from that population."

However, this is probably not the case, he elaborated. "Walleye are fairly tolerant of warm water but they are very intolerant of pollution," Kornegay explained. "I'm guessing, but this Albemarle run of walleye probably died out in the 1940s or 1950s when the lower Roanoke River became industrialized and more polluted."

Species Can Change from Female to Male

New Crustacean Discovered on Coast

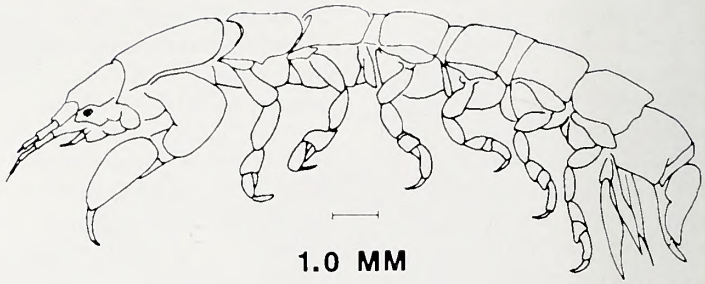
While most undiscovered species are thought to lurk deep within the jungles of the Amazon or Africa, it seems the Tar Heel coast still has a surprise or two for biologists. Just ask Courtney Hackney, a biology professor at the University of North Carolina at Wilmington, who has discovered a previously unknown marine isopod that's actually able change its sex from female to male.

Dr. Hackney, along with his wife, Rosemarie Ganucheau, discovered the crustacean, known as *Cyathura madelinae*, two years ago in the salt marsh along Bradley Creek near Wrightsville Beach. The isopod, which grows to a length of about three-quarters of an inch, was officially recognized in a recently published article in the scientific journal *Crustaceana*. Hackney and his wife discovered the isopod while conducting research for a similar species found in North Carolina.

So far, Bradley Creek is the only known location of *Cyathura madelinae*, although Hackney suspects the species may be found elsewhere in similar tidal habitat. The new species is similar to two other isopods found in North Carolina, *Cyathura polita* and *Cyathura burbanki*. While all three species are found in or near Bradley Creek, the new species is found in the black needlerush grass of the intertidal marsh above the normal flow of water. *Cyathura polita*, however, is found in subtidal marsh and *Cyathura burbanki* is usually found in deeper water. "*Cyathura madelinae* has bigger eyes and longer antennae than the others," Hackney explained. While not a lot is currently known about its habits, *Cyathura madelinae* probably eats detrital material, bacteria and other small marine organisms, Dr. Hackney explained.

Cyathura madelinae live for two years and begin their lives as females. In their second year, only some of the females transform to males, allowing a large number to remain as females to breed and bear young. "This life cycle is common among *cyathura*," Hackney said, adding that there are currently about 20 species known worldwide. In Bradley Creek, the isopods appear very abundant despite the fact that each female bears only about 10 to 30 offspring.

Dr. Hackney, a member of the state's Coastal Resources Commission, said that increasing freshwater runoff from development along Bradley Creek could pose a threat to the species. However, because of their abundance, they seem well adapted to freshwater intrusion in the salt marsh. Dr. Hackney and other biologists will be conducting research this summer to determine if the species is found elsewhere.



UNC WILMINGTON

A New Find: *Researchers at the University of North Carolina at Wilmington recently discovered this previously unknown isopod species,* Cyathura madelinae, *in the salt marsh near Wrightsville Beach. This isopod is able to change its sex from female to male.*

Funds Needed for Restoration

Environmental Education Project Proposed on Currituck's Monkey Island

Although Monkey Island in Currituck Sound is only seven acres in size, there's been an enormous amount of history packed onto it over the centuries. In pre-colonial days, Pumonkey Indians — for whom the island is named — used the island as a summer home and for a burial ground. After the Civil War, the island became an exclusive hunting camp for wealthy tobacco and publishing magnates.

Today, the island stands to make history again if plans to convert the old hunting lodge into an environmental education center become reality. Monkey Island is now owned by the County of Currituck, which has granted the Currituck County School System permission to stabilize the island, renovate the lodge and establish an educational center that could be used by a variety of federal and state agencies, schools and universities.

The island is an excellent place for an educational facility, said Greg Schwarga, the Monkey Island Project Leader. The site has just been registered as a Natural Heritage Area. Herons and egrets use the southeastern corner as a rookery, and the island offers on-site access to Currituck Sound and the Atlantic Ocean. Currituck's school system hopes to convert two of the eight rooms of the old lodge into classrooms or laboratories. As envisioned, students and teachers could use the island as a environmental education center, state and federal agencies could use it for environmental monitoring of nearby waterways and universities and schools could use it as a research center.

A major problem, however, is obtaining adequate funding. Erosion is threatening sections of the island and deteriorated bulkheads need repair. Converting the old hunting lodge into a facility with laboratory and classroom space will be expensive. With local and school budgets tight, major funding from the public sector seems out of the question, at least until the facility is up and running. Therefore, Currituck County Schools is actively seeking private funding to help with the renovation and repair costs, which are expected to run over $700,000. "Although the renovation is expensive, any little bit we can get would help," Schwarga explained. For more information, contact Greg Schwarga, Currituck County Schools, Box 40, Route 168, Currituck, N.C. 27929, or call (919) 232-2223.

Big Bird Makes Big Comeback

Wild Turkey Restoration Sets Records in State

This year has already been a good one for the wild turkey in North Carolina. Restoration efforts during the January-through-March trapping season set new records for the number of wild turkeys relocated, the number of birds trapped in-state, the number of birds obtained from other states and the number of restoration areas receiving birds.

A total of 251 wild turkeys were relocated to 18 different restoration areas across the state. Before this year, the largest number of wild turkeys relocated to North Carolina was in 1986, when 146 birds were relocated to 11 different restoration areas. Of the 251 birds relocated, 159 were trapped in North Carolina, compared to the previous high of 120 birds in 1986. The Wildlife Resources Commission also acquired 92 wild turkeys from the state of Wisconsin to supplement their own birds. The previous high for acquisition of birds from other states was last year, when the Commission acquired 70 birds from South Carolina.

Wild turkey populations are improving, especially in the western region of the state, permitting intensified trapping efforts that have helped increase the numer of birds relocated in-state. Birds from other states were obtained through the National Wild Turkey Federation's Superfund program. Under this program, the state furnishing birds is reimbursed for the trapping costs by the state receiving the birds. These monies are earmarked to be used for wild turkey management or habitat acquisition in the state furnishing the birds.

The wild turkeys relocated this year were well distributed across the state. All nine Wildlife Commission districts received birds. Counties where these restoration areas are located include: New Hanover, Bladen, Hertford, Harnett, Anson, Halifax, Moore, Alamance, Wilkes, Yancey, Surry, Iredell, Catawba, Cleveland, Rutherford, Avery, Swain and Transylvania.

Areas where wild turkeys are stocked normally remain closed to turkey hunting for about five years for the population to become established. A minimum of 5,000 acres of suitable habitat is required for a wild turkey restoration project, and cooperative agreements with landowners are signed to help manage and protect the birds. The ultimate goal of the project is to restore the population of wild turkeys to all suitable habitat in North Carolina. This year's progress is a big step in reaching that goal.

— *Mike Seamster*

MELISSA McGAW

Catch and Release: *This wild turkey was captured at one site and released at another to increase turkey populations and range across North Carolina. Biologists with the Wildlife Resources Commission set new records this year in their reintroduction efforts.*

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, NC 27604-1188.

Status on April 30, 1990

	Number Sold	Revenue Received
Lifetime Sportsman's Licenses	49,355	$18,439,812.06
Lifetime Hunting Licenses	639	179,732.35
Lifetime Fishing Licenses	3,829	883,845.83
Lifetime Subscriptions to *Wildlife in N.C.*	1,950	268,870.37
Contributions	—	176,129.79
Total	55,773	$19,948,390.40
Total Interest Earned		$5,591,859.90

Too Many in Pamlico County, Reader Writes

Can Bluebird Displace Other Species?

Dear Editor:

Regarding the letter from Linda Phillips, p. 30 of the March 1990 issue of *Wildlife in North Carolina:*

Linda Phillips is either daydreaming, refusing to accept facts, or trying to perpetuate a myth! Thirty years ago the eastern bluebird did need help due to low-density populations. But in this day and age it needs help about as much as a house sparrow or house finch needs help. The problem is, there have been so many bluebird boxes erected that the bird is now a nuisance (in Pamlico County).

As a bander of all species, I have observed during these last two years (1988-89) bluebirds individually or collectively displace or mob Carolina chickadees, great-crested flycatchers, prothonotary warblers and tufted titmice from nest boxes. I might add here that the prothonotary warbler and the great-crested flycatcher, once driven from their nests, rarely return to nest in that particular area. The titmouse and chickadee problem was solved by putting a hole restrictor on each box. Unfortunately, the prothonotary warbler and the great-crested flycatcher use the same size box with the same size entrance hole as bluebirds. When the bluebird wants another bird's nest, it just takes it over or builds a new one on the top of the one already there.

Since bluebirds in this area are nonmigratory, large broods breed larger broods and simply overwhelm other species. The net result is that bluebirds in the Pamlico County area have taken over a given area by sheer numbers. This bird is on the verge of becoming a pest. In this area, there are far fewer prothonotary warblers and great-crested flycatchers.

Please folks, heed this letter before the bluebird displaces more than the great-crested flycatcher and the prothonotary warbler!

Dorothy Foy
Oriental

Editor's Note: Dorothy Foy has been a licensed bird bander for the U.S. Fish and Wildlife Service since 1969 and is also a licensed wildlife rehabilitator.

Though bluebirds may be outcompeting birds in some localized areas such as Pamlico County, bluebird overpopulation does not seem to be a problem statewide, says ornithologist Harry LeGrand. He suggests that people can reduce the threat of overpopulation by erecting boxes with hole openings of different sizes and placing them in different habitats. That would provide homes for a variety of species, not just one.

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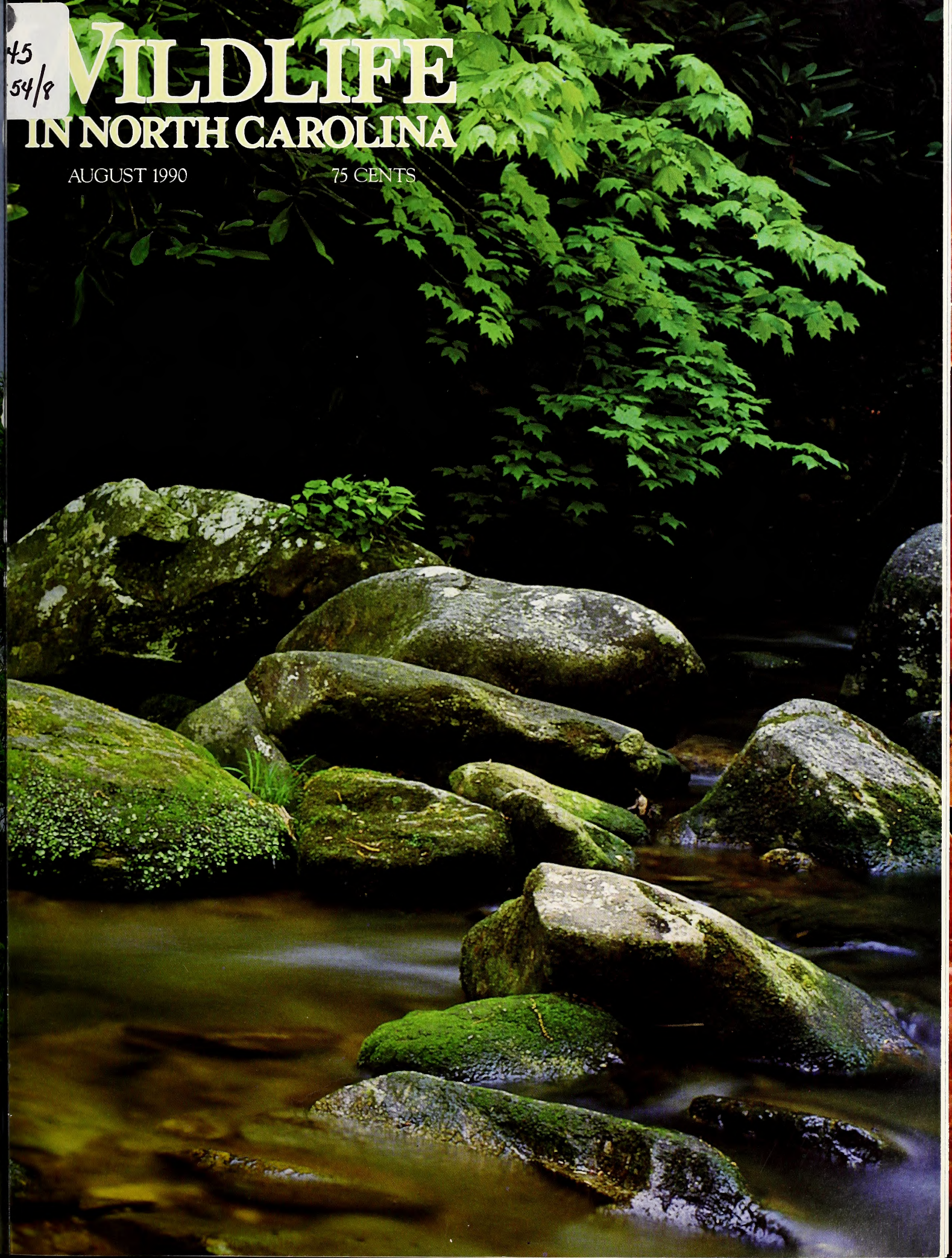

Down and Dirty

by Jim Dean

Upon his return from a week-long fishing trip, one of my friends found his wife waiting for him in the yard with a garden hose, a tire brush and a box of industrial strength soap powder. "Well, I was still wearing the same clothes I left in, so I guess it was understandable," he said. "Had to peel my socks off with a putty knife. On the other hand, none of my fishing buddies found my personal habits repugnant."

Indeed! Could it be that he and his companions had ripened together until they all smelled like an August roadkill? Getting grungy beyond all imagination seems to be the special talent of fishermen, hunters and, especially, campers. The only people who even look that filthy are Marines in boot camp. The difference is that Marines don't love it.

ILLUSTRATION BY JACKIE PITTMAN

Case in point. After two solid days of bass fishing last summer, Jack Avent and I loaded up and headed for home. We were sweaty, sunburned and covered with mud, dried algae, fish slime, scales, motor oil, suntan lotion and insect repellent. You could tell where we'd missed applying repellent because those spots were bloody graveyards for countless mashed carcasses of mosquitoes and deer flies. We were every socialite's nightmare, and I must admit we sort of reveled in it.

"Boy, are we grubby," said Jack reverently. "My teeth feel like they've got little sweaters on them."

Compared to serfs in the Middle Ages, early explorers or bums riding the rails, most folks today have no familiarity with real dirt. Few can even imagine the kind of patina a week in the woods can yield and have no appreciation for it.

Some years ago, we coaxed Mom into joining a family camping trip. After her tent was set up, she disappeared into it for about an hour. When I peeked in later, it looked exactly like her bedroom at home. The cot had been made up with clean, neatly tucked sheets, there was a throw rug on the floor, and a battery-powered lamp and alarm clock sat on a crocheted doily on a bedside stand. I feel quite certain she would have hung pictures of her grandchildren had she been able to drive a nail in canvas. Later that evening, she sat around the campfire in a quilted robe and bedroom slippers. She accepted all our kidding with befitting grace, and in all fairness I think she had a grand time.

Those of us more accustomed to outdoor living are quicker to bend any rules regarding personal hygiene and fuel intake. For example, you would never dream of eating something you dropped on a spotless kitchen floor, but a hotdog that squirts out of your roll and falls into the mud can be wiped on a sleeve and safely consumed.

There's a story that a cowboy was once asked why he put so much pepper on everything he ate. "That way," he replied, "I don't have to wonder what all those little black specks are."

My pickiness as a child (brat is probably more accurate) became part of family legend when I once slept through an afternoon nap with a green pea in my mouth rather than swallow it. As an adult, however, I will routinely scarf a raw turnip picked up in a field or eat soybeans straight off the stalk. Just this spring at Mattamuskeet, I ate two ham sandwiches that I retrieved from the bilge of the boat, where they had been awash in a half inch of gasoline. Well, it *was* unleaded.

Some of us develop this tolerance early in Scouts, when the only thing you really try to remove from your food is something still moving. One fellow in our troop found worms in part of a coconut candy bar but still ate the part that had none. His dog ate the rest. Waste not, want not. It was also as Scouts that we learned to wash mess kits with sand and river water, and that knives and forks required only a perfunctory wipe on your pants. In our troop, anybody caught washing his face, combing his hair or changing clothes was branded a sissy.

As a kid, one of my favorite places in all the world was a ramshackle cabin built on pilings above a marsh in the mouth of the Little Alligator River near Ft. Landing. It was no place for the fastidious. From all evidence, the kitchen shack must have literally been privy to every rat in Tyrrell County. What little washing we did was in the rain barrel that collected water from the roof, and after a few days, your skin developed a glaze that not even a salt marsh mosquito could penetrate. It was wonderful.

As we get older, most of us grow less tolerant of such conditions. We spend a fortune on soap, deodorant, toothpaste and shampoo, and few of us are comfortable if we don't get a daily shower. Yet, think about the best times of your life. I'll bet you've been socially repulsive during most of them. In good company, soap is optional.

August 1990
Volume 54, Number 8

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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DEPARTMENTS

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Back of the Book *by Vic Venters*

Cover *Once, you could safely drink from virtually every flowing stream in North Carolina. These days, pure water free of silt is increasingly rare, and even the most inviting brook may harbor dangerous organisms or other pollution. Photograph by Ken Taylor.*

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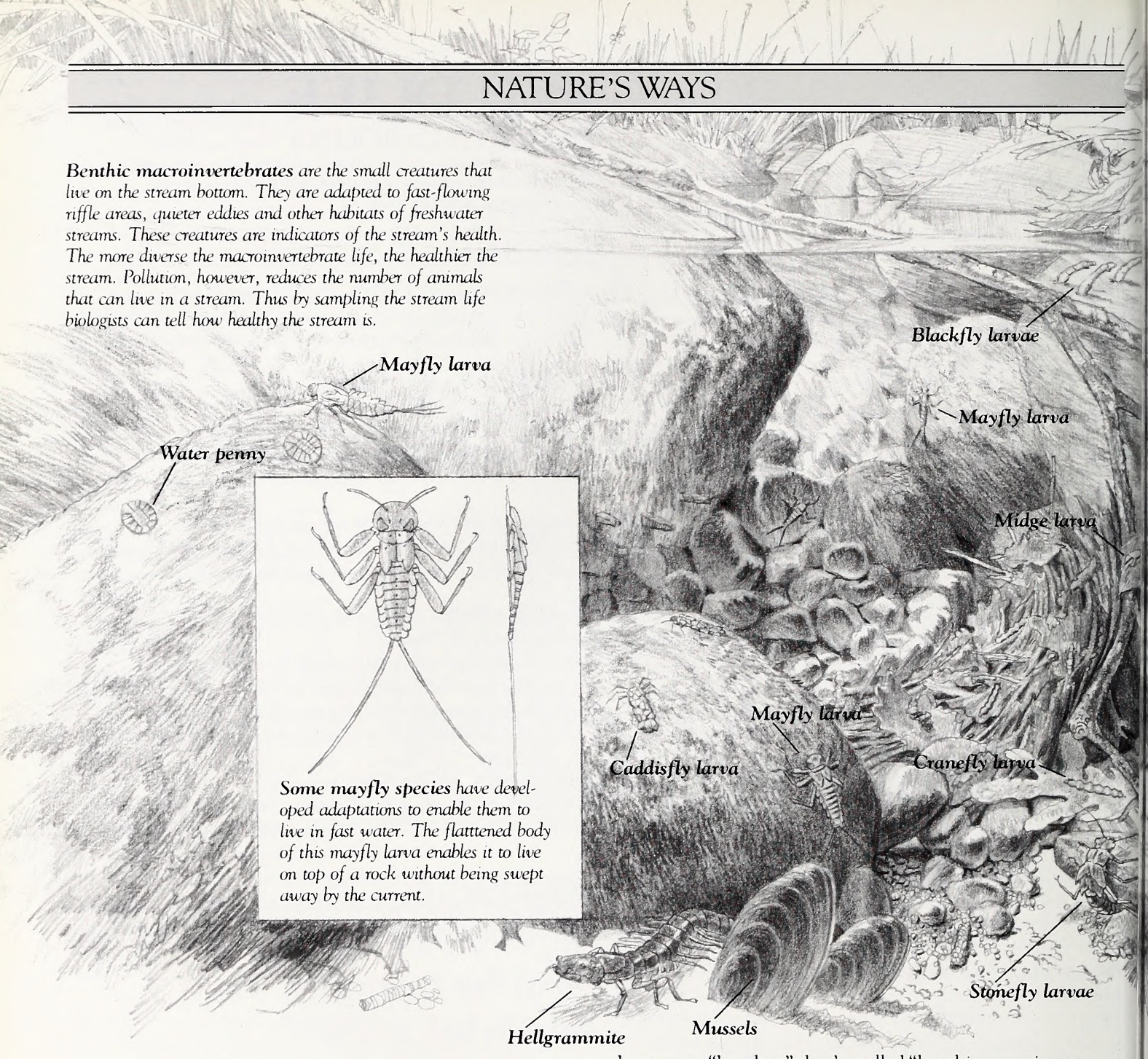
Benthic macroinvertebrates *are the small creatures that live on the stream bottom. They are adapted to fast-flowing riffle areas, quieter eddies and other habitats of freshwater streams. These creatures are indicators of the stream's health. The more diverse the macroinvertebrate life, the healthier the stream. Pollution, however, reduces the number of animals that can live in a stream. Thus by sampling the stream life biologists can tell how healthy the stream is.*



Some mayfly species *have developed adaptations to enable them to live in fast water. The flatttened body of this mayfly larva enables it to live on top of a rock without being swept away by the current.*

Taking a River's Pulse

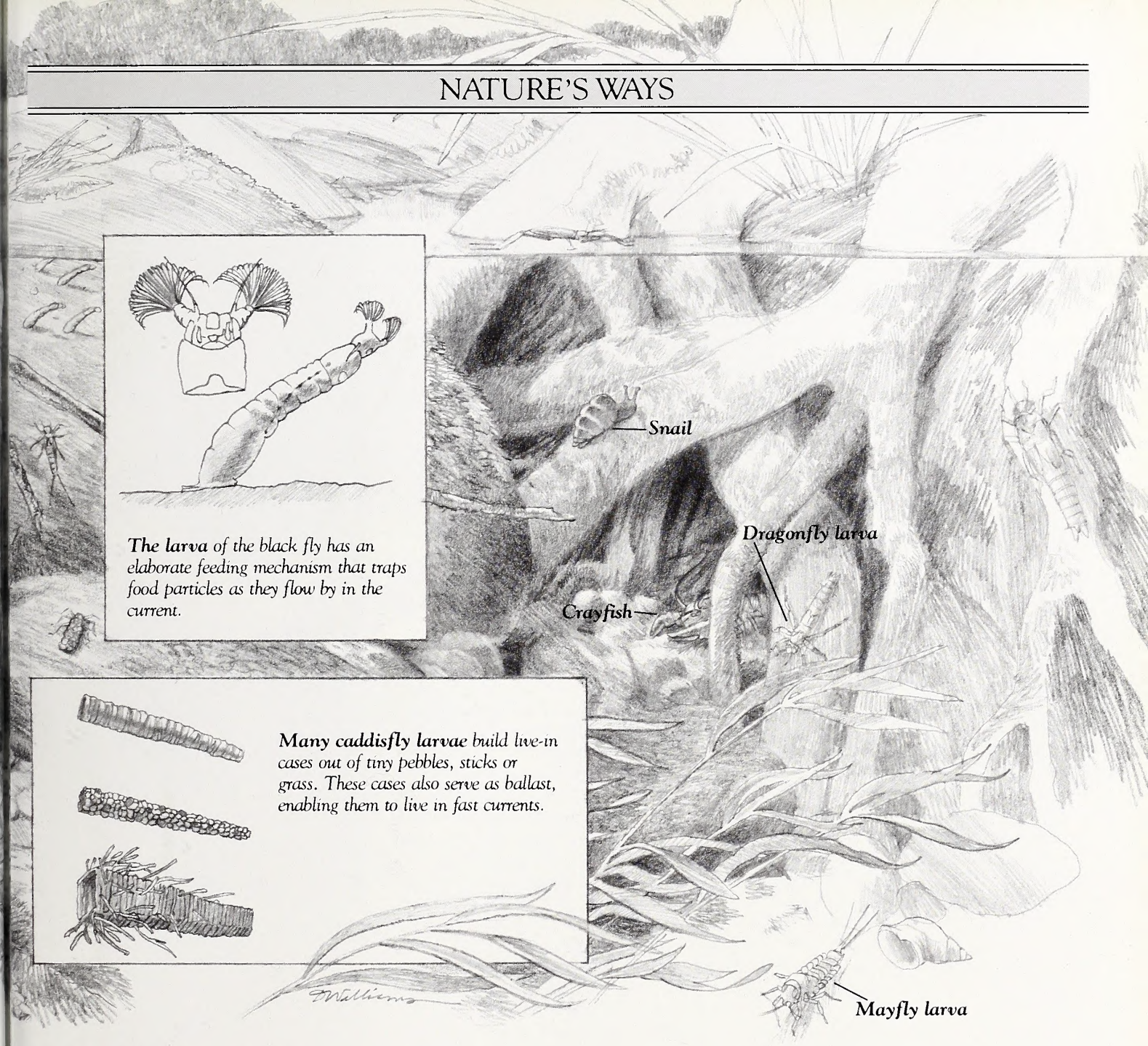
written by Lawrence S. Earley/illustrated by David Williams

In a hundred yards of a healthy Piedmont stream, you might find about 20 fish species, but in the same stretch you could turn up as many as 300 species of macroinvertebrates.

Macro-who? Macroinvertebrates are the organisms you'd find if you ran your hand over or under a stream's submerged rocks and logs and through its grass beds. They include worms, snails, crayfish, clams and mussels, beetles, leeches and the larvae of black flies, dragonflies and other insects — thousands of species statewide. Because they're found on the stream's bottom, or "benthos," they're called "benthic macroinvertebrates": the "macro" means they're large, greater than 1 mm.; "invertebrate" means that, unlike fish, they have no backbone.

To live in often fast-moving water, these creatures come equipped with adaptations that include flattened shapes, suckers for sticking, hooks for clinging, and even ballast for extra weight in the current. Some have learned to live in the relative calm beneath rocks or in quieter eddies, crawling quickly from place to place when they need to move.

Current speed, water temperature, food and habitat (boulders, logs, grass) will determine where many of these creatures are found. Some species are better adapted to cool, fast-flowing waters while others prefer the warmer, slower waters of the Coastal Plain. The community also changes when the chemical or physical properties of the water change. Many insects (in particular mayflies, stoneflies and caddisflies) are



***The larva** of the black fly has an elaborate feeding mechanism that traps food particles as they flow by in the current.*

***Many caddisfly larvae** build live-in cases out of tiny pebbles, sticks or grass. These cases also serve as ballast, enabling them to live in fast currents.*

quite sensitive to pollution, and changes in the stream environment cause repercussions in the insect community.

Knowing this, biologists can tell how healthy a river is by sampling the macroinvertebrate life, particularly the insects. Hundreds of mayflies, stoneflies and caddisflies belonging to more than 40 different species might be found in an unpolluted stretch of a hypothetical river. That's excellent diversity and clearly shows that the river is healthy. But a leaking municipal water-treatment plant upriver would have predictable effects: the added nutrients would stimulate algae growth, which would swell the populations of some species of insects. Now there might be thousands of insects but the species diversity might fall to 15, a sure sign that something is wrong.

Toxic metal pollution has different effects: biologists might work hard to find 35 insects belonging to only 10 species. Sedimentation, the most common pollutant in the state, covers many stream habitats, dooming most macroinvertebrates.

Pollution also causes detectable shifts among species as the ones sensitive to pollution drop out. For example, in the healthy stream, two mayfly species (*Stenonema modestum* and *Ephemerella catawba*) that are tolerant of pollution might live side by side with two that are intolerant (*Ephemerella argo* and *Stenonema exiguum*). If the stream were polluted by nutrients, the two intolerant species would not be able to survive and the community would be dominated by *E. catawba*, a species that can tolerate nutrient-enriched waters. Similar shifts would occur among the stoneflies and caddisflies.

Like the canary released into mine shafts suspected of contamination with noxious gases, benthic macroinvertebrates give early warnings about water pollution. By learning to understand these creatures' responses, biologists have an invaluable tool in protecting water quality in our state.

Offshore Bread & Butter

Billfish are the glamour species and king mackerel the everyday favorites, but tuna, dolphin and wahoo are attracting more attention these days.

written and photographed by Joel Arrington ©1990

Up until about a decade ago, when a North Carolina angler wanted tuna, he went to the grocery and bought a can. These days, however, increasing numbers of offshore fishermen are using small boats or charters to catch their own.

Times have changed. Technology has improved boats, motors and electronic equipment, and saltwater fishing has lured more and more participants over the decades. Billfish are still the glamour species, and many anglers desire to catch and release a marlin or sailfish above all others. But even before current regulations required release of all but trophy-sized billfish, American anglers never acquired a taste for them in any numbers. Fortunately for the fish, a market for billfish never quite got started in the U.S. before a federal management plan banning sales went into effect in 1988.

The other offshore pelagics — wahoo, tuna and dolphin — are much more accessible over the season and come in sizes and flavors more suitable for seafood dinners. While receiving less-breathless treatment in fishing magazines, these bread-and-butter species nonetheless provide plentiful opportunity for sport. Now thousands of competent anglers out of marinas from Oregon Inlet to Southport pursue them with increasing success.

Charters run in season out of all of North Carolina's sport-fishing ports. Since wahoo, tuna and dolphin are for the most part associated with the Gulf Stream, trips to fishing locations are likely to be shorter and fishing times longer off the state's northern sectors where the Stream closely approaches Cape Hatteras. For a time in late summer, water temperatures are more nearly ideal north of Cape Hatteras than south of it.

Over the last 20 years the proliferation of small but capable private craft for offshore fishing has been driven largely by the desire to catch king mackerel. Anglers after kings, which are likely to hold over wrecks and rough bottom, soon learned that they could fish different locations and do well on dolphin and wahoo and that often tuna would take their live baits and keep going. Unlike kings, these fish tend to work offshore rips, water color changes and weed lines, where "slow-trolling" — as offshore live-bait fishing came to be called — is quite successful. The bottom formations that attract kings, however, also sometimes create upwellings that attract tuna and wahoo, if not dolphin. "The Point" southeast of Oregon Inlet and "The Big Rock" off Cape Lookout are both formations that are well known for attracting these offshore pelagic species.

Live baits are not necessarily the best baits for the bread-and-butter species. While anglers frequently have success slow-trolling and with lures, far and away the great majority of wahoo, tuna and dolphin are caught on ballyhoo. Tons of these billed baitfish are caught in tropical areas, then graded and frozen in plastic bags for the sport-fishing industry. Rigging such cigar-shaped trolling baits either to skip on the surface or to swim just beneath it is a basic skill of offshore fishing. Often a colorful skirt or nylon jig will be placed ahead of the bait.

Tuna fishing off the middle Atlantic states began to soar in the late 1970s, grew to unprecedented levels and seems to have peaked in 1986. Catches have been down since. No one has an explanation, other than that fish movements are hard to predict. Overall, recreational catches of tuna are down, according to the National Coalition for Marine Conservation, but fishing off the middle Atlantic states remains quite good at times.

Off North Carolina, we get four of the 14

tuna species that roam the world's oceans — blackfins, bigeyes, bluefins and yellowfins. The small blackfin has actually declined here as other species have increased. Limited to the western Atlantic ocean, blackfins appear early off North Carolina, usually in March, and seldom weigh over 10 pounds. Blackfins are one of the most common species found in blue marlin stomachs.

Atlantic bigeye tuna often weigh over 100 pounds and can exceed 375. Never common, they prefer cool water and may run deep, below the thermocline for much of the summer, when catches decline. Commercial fishermen catch most of them in fall and winter off Oregon Inlet, but when schools migrate past Cape Hatteras, generally in cool weather, sport fishermen manage to catch a few.

Bluefin are the largest tuna species, with some individuals exceeding 1,000 pounds, but the big fish are becoming rare, and most conservationists consider the bluefin situation critical. The fishing industry managed to get tunas excluded from federal legislation that provides for management plans for billfish and other offshore pelagics, but efforts continue to redress what many consider a serious shortcoming in the law.

This yellowfin tuna *was hooked on an artificial squid trolled offshore. Yellowfins may never be as popular as sailfish or blue and white marlin, but they fight hard and grow large. Fresh tuna is also superb eating.*

***School dolphin are** relatively easy to catch on light spinning tackle or a flyrod. Larger bull dolphin tend to be solitary. Dolphin afford great sport, frequently leaping clear of the water. Many anglers consider them the best eating and most colorful of all saltwater species.*

The North Carolina bluefin record is 732½ pounds. In some years, school fish of 70 to 150 pounds move into shallow water off Oregon Inlet in May, where, though visible on the surface, they have been difficult to catch. Charter skippers try, however, and sometimes succeed by trolling big spoons slowly on very long leaders far behind their boats. These same fish have been much more aggressive when they have appeared off Virginia Beach a few weeks later in slightly warmer water, but even here, bluefins are notoriously finicky. Bluefins are more likely to take artificial lures off Virginia than off North Carolina, for unknown reasons. Occasionally, streamlined lures called "cedar plugs" work well here when trolled rapidly, but for the most part we catch our tuna on bait.

By far, the greatest increase in tuna fishing over the last decade can be attributed to yellowfin, formerly called Allison tuna. Frequently running 25 to 35 pounds, yellowfins may exceed 200 pounds in our waters and 400 pounds in the Pacific. Best fishing is in May and June, September and October.

Only experts can distinguish some bigeye from yellowfin tuna. Those who know the difference must pry open gill covers and count rakers or cut open the fish and examine the liver. As a consequence, many small bigeyes are mistakenly identified as yellowfins.

When I first began offshore fishing in the 1960s, hardly a coastal restaurant had fresh tuna on its menu. Now almost all do, and demand for tuna has pushed the retail price at markets to over $9 per pound at times.

Most anglers are not prepared for the fish-cleaning job facing them after a successful charter on which perhaps 200 pounds or more of tuna, wahoo and dolphin may be caught. Major marinas have cleaning and storage services, but the bill can be high. Equipped with plastic bags and sharp knives, anglers can dress their own fish at a cleaning station. For tuna, cut just through the skin down beside the dorsal fin, across the narrow part of the tail, up the belly and angle above the stomach to the gill plate. Grasp the skin with pliers and pull it off, then cut the meat off the frame. Big fish present a big job, so you may prefer to leave cleaning to the pros.

There is only one wahoo species. Elongated and toothy, like a king mackerel, wahoo may reach 150 pounds but often run less than 20 pounds. Unlike tuna and dolphin, wahoo fishing off North Carolina has been remarkably consistent for at least 15 years. These fish migrate along the Gulf Stream and are often found near wrecks and deep under floating debris. The best fishing for them is between May and October. Fast-moving baits dressed with black, purple or green skirts or jigs seem to lure them better than others. They strike like lightning and take line against drag as if they were much bigger fish.

Wahoo over about 15 pounds lend themselves to steaking. You can, with practice, cut an unskinned fish into crosscuts one vertebra thick. Less oily than a king mackerel, wahoo must be fried or broiled not a minute too long or it will dry out. Try simmering the meat until it flakes easily, pick it off the bones and then make one of the best fish salads you've ever tasted.

Dolphin (the fish, not the mammal) associate with their primary forage, flying fish, as both species migrate up the Gulf Stream. June is by far the best month for big fish, as indicated by entries in the North Carolina Saltwater Fishing Tournament. Smaller, schooling fish arrive in number by late April, concentrating usually around floating debris and sargassum weed. Above about 10 or 12 pounds, dolphin tend to break away from schools and travel as mated pairs, although still associated with floating cover. Top weight is about 90 pounds, and 50-pounders are uncommon catches off North Carolina. Most of the fish are the

Aptly named the *"greyhound of the sea," the distinctively barred wahoo often makes long, sizzling runs when hooked and is considered a real prize by many offshore fishermen.*

"chicken" or "shingle" dolphin weighing less than 5 pounds. Annual success on fish varies widely, for unknown reasons. Last season brought more dolphin to North Carolina waters than even the oldest charter skippers can remember. Proposals to set a creel limit on dolphin have circulated recently, but so far the regulatory agencies have not adopted one.

If an angler could ever fall for a fish, it would be the dolphin, for they have it all: strength, speed, aerial show, stamina and beauty. Aggressive after lures as well as bait, dolphin will approach a boat and cooperate with anglers better than probably any other species. To top it all, they are among the very best fish on the table.

Skin a dolphin like a tuna, cutting around the fillet and peeling the skin off with pliers. Their roes are especially good. Dolphin is excellent cut into fingers, battered and fried, or broiled with butter and lemon. Many eastern North Carolinians like dolphin grilled over coals with barbecue sauce.

Tackle for these bread-and-butter species runs from heavy to light. Big tuna are not to be trifled with. Eighty-pound class rods and big reels loaded with line testing to 100 pounds are none too heavy. Since there is always a chance of a big blue marlin, a practical approach for trollers is to use big rods until you begin catching smaller fish, then break out the light stuff. Yellowfins are often about right for 50-pound tackle. Rods designed for use from a belt are efficient and fun, but anglers should accept the possibility of a big blue marlin's emptying even the biggest reels of line.

Once you've located school dolphin along a weed line, you may catch many. Light trolling rods, down to about 20-pound class, are much more fun than marlin tackle. Fish will often follow a hooked dolphin to the boat, where anglers can cast small lures on light spinning tackle. Twelve-pound test is about right. Leave your gang-hooked plugs at home. Lures with single hooks, like jigs, spoons and metal squids, are more practical, and speckled trout grubs work well. A long-handled net will make boating fish on light lines much easier, but no charter boat is going to have one, so you'll have to bring your own.

Tuna, dolphin and wahoo sustain the offshore charter fleets between billfish and remain a more or less dependable resource for the growing flotilla of private craft running out of North Carolina ports. On the rod or on the table, who could ask for more? ⊠

Old River, New Trouble

When the New River in Ashe and Alleghany counties was named a Wild and Scenic River in 1976, many citizens breathed a sigh of relief. Now, the New River is in a do-or-die fight with another foe.

by Vic Venters
photographed by Ken Taylor

In 1671, an English expedition chanced upon the New River in what was then the Appalachian wilderness. The explorers were perplexed to find that — unlike other regional rivers that flowed southeast or southwest — this river flowed to the north and west. Surely, they reasoned, this twisting waterway must lead to the "great ocean," that mythical body of water that lured so many early explorers with its promises of new trade routes and riches. Before turning back, the Englishmen placed a stick in the water, which promptly seemed to float backward. Deluded perhaps by visions of gold, they believed the New River to be tidal. From atop a nearby hill looking west, they reported seeing "a fog arise and a glimmering light as from water." The "great sea," and all the wealth its discovery promised, seemed only a mountaintop away.

These misguided explorers, unfortunately, were not the last to be seduced by the allure of profit from this ancient waterway. Today, the New River valley in North Carolina is besieged by a runaway real estate boom, developments that threaten to alter permanently the character of the continent's oldest river. Ironically, the New was considered to have been "saved" from a massive dam and reservoir project in the mid-1970s when the river was placed in the National Wild and Scenic Rivers System. In the years since that designation, residential subdivisions have begun sprouting along the river like cancerous growths, and golf courses and condominiums are only a bulldozer ride away.

Down by the river in Ashe and Alleghany counties, there are still some places where it's easy to imagine that the clock stopped ticking in the 19th century. Traditional white frame farmhouses lie sheltered in hidden swales; from their porches unfold panoramic views of old log barns, small fields, pastureland and Christmas tree plots. The brown earth is rich, the grass plush, the cattle fat. This is no wilderness, but a vintage working landscape, and a fine one at that.

Nestled between the ridgetops, the New River

For hundreds of years, *the New River in northwestern North Carolina has flowed through a traditional agrarian landscape. This pastoral setting is increasingly threatened by a flood of residential and second-home building.*

Old River, New Trouble

Flowing timelessly, *the New River is second in age only to the mighty Nile. In 1976, the New was saved from a massive dam and reservoir project when it was designated a National Wild and Scenic River. Unfortunately, this has not stopped extensive development.*

Two Classifications

The New River in North Carolina is classified under two river protection programs, the National Wild and Scenic Rivers Act and the North Carolina Natural and Scenic Rivers Act.

National Wild and Scenic Rivers Act: Under this federal designation, a scenic river must be "free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped but accessible in places by roads." A river may be managed either by federal agencies and funds or by mandating that the sponsoring state assume responsibility at no cost to the federal government. With the New River, the latter designation was utilized.

North Carolina Natural and Scenic Rivers Act: By this state law, designated free-flowing rivers are protected from impoundments. However, no other land-use regulations are included. The act's mission is "to protect rivers with outstanding natural, scenic, educational, geological, recreational, historic, fish and wildlife, scientific and cultural values."

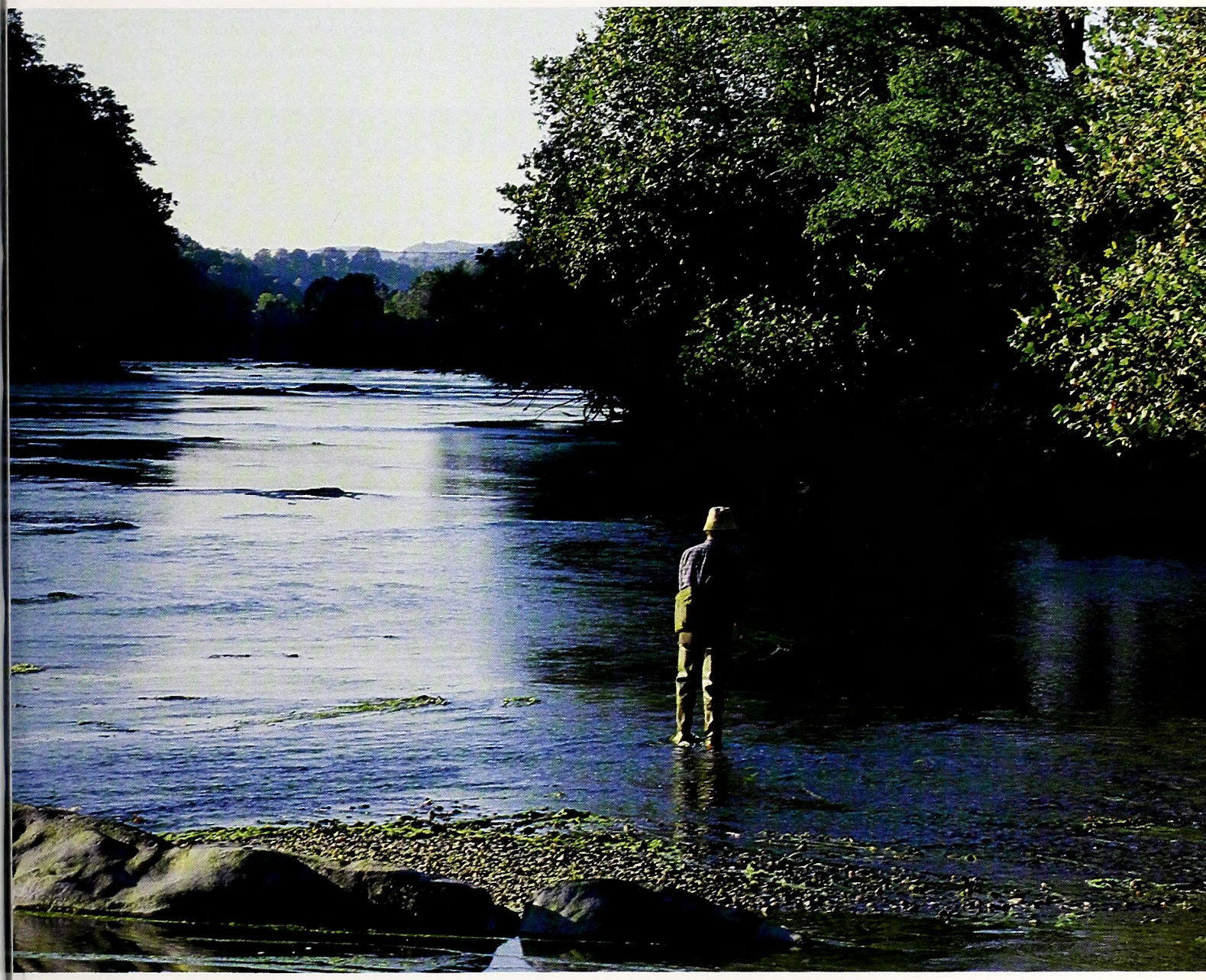
snakes northward toward the rolling hills of Virginia. As the continent's oldest river — second globally in age only to the Nile — the billion-year-old New once formed the headwaters of the Teays River, a 15-mile-wide goliath that was this continent's mightiest waterway before glaciers buried it. The New actually predates the Appalachian mountains through which it flows, and it traces a serpentine, meandering course through the mountains, an ancient characteristic it has retained from the days when it flowed through flatter terrain. Because it is older than the mountains, it is also the only river to bisect the Appalachian plateau from east to west as it travels through northwestern North Carolina into Virginia and West Virginia.

In the late 19th century, the New River valley in North Carolina was known as the "lost province." Like much of the mountain region, a history of poor roads and communications kept inhabitants of the valley isolated, creating a self-sufficient, agrarian economy with the small family farm the cornerstone of society. During much of the 20th century, the valley remained seemingly lost in time, that is, until the Appalachian Power Company announced its intention to build a hydroelectric power dam on the upper New in 1962.

As planned, the dam would have supplied big-city customers in the Midwest with peak demand energy. The project would also have actually used more electricity than it generated (by pumping water from one reservoir to another). Aside from the dubious energy efficiency of this plan, the project would have permanently altered the free-flowing nature of the river and inundated 44 miles of the main channel of the New River, 27 miles of its South Fork, and 23 miles of the North Fork. In short, an environmental nightmare.

What's crucial to realize, however, is that it would have also drowned a traditional way of life by flooding hundreds of centuries-old farms in the valley and displacing almost 3,000 inhabitants. Because it threatened a historic, traditional lifestyle, the project transcended what some considered "narrow" environmental concerns and brought together politicians and citizens from across the political spectrum. Old-line conservatives joined hands with environmentalists, and the State of North Carolina likewise opposed the project. In 1976, after a bitter, 14-year-long battle, Congress placed the New in the National Wild and Scenic Rivers System, a designation that scuttled the dam. Opponents of the power project were jubilant; the New had been saved, a lifestyle preserved.

With the New's designation, the National Wild and Scenic Rivers Act mandated that the State of North Carolina assume responsibility for the river's management "at no cost" to the federal government. The New was also designated a North Carolina Natural and Scenic River, a system that includes the Horsepasture, Linville and Lumber rivers. Under the designation, 26.5 miles of the South Fork of the New — along with the 14,223 acres in the visual corridor of valley — were to be protected up to the Virginia state line. The N.C. Division of Parks and Recreation was charged with implementing a management plan, protecting the natural character of the river, and creating a state park at selected sites in the corridor. Agrarian activities were to be allowed and encouraged, preserving the picturesque landscape. As its guiding principle, the act called for the state to maintain the "rational balance between the conduct of man and the preservation of the natural beauty" along the New.



Unfortunately, the scales of "rational balance" have tipped heavily in favor of development. The 1980s have seen a tremendous real estate boom in second homes on the New from Boone downstream through Ashe and Alleghany counties. As old-time landowners have died, large farms have been auctioned off, subdivided, and carved into tiny lots. Land prices along the river have soared fivefold — and sometimes more — and the number of river valley landowners has increased at least 300 percent. Last year, land sales in Alleghany County topped $25 million, while the Christmas tree industry, a former economic mainstay, grossed only $5 million. At this rate, an Alleghany County newspaper estimated, the entire county would be sold off in 10 years or less. (Local realtors, ironically, complained that last year was a slow season.)

Equally disturbing is the shoddy nature of much of the development planned or under way. "They (developers) are clear-cutting on near-vertical slopes and building substandard roads, creating severe erosion problems and severe adverse impacts on the visual corridor," reported Bern Collins, a planner and manager for the National Park Service, the federal agency that administers the National Wild and Scenic Rivers program. "There are large subdivisions planned and under development throughout much of the 26.5-mile corridor." So far, attempts at land-use regulations in Ashe and Alleghany counties have been repeatedly shot down at the local level. "Currently the feeling towards any type of zoning is generally hostile," said Clifford Stamper, president of the National Committee for the New River, the citizens' group that has led the fight to preserve the river since the Appalachian Power controversy.

As well as destroying the aesthetic beauty that draws so many canoers and rafters, uncontrolled development could threaten the New's excellent wildlife and fishery. "Smallmouth bass are fairly sensitive to sediment on their eggs," said Joe Mickey, an N.C.

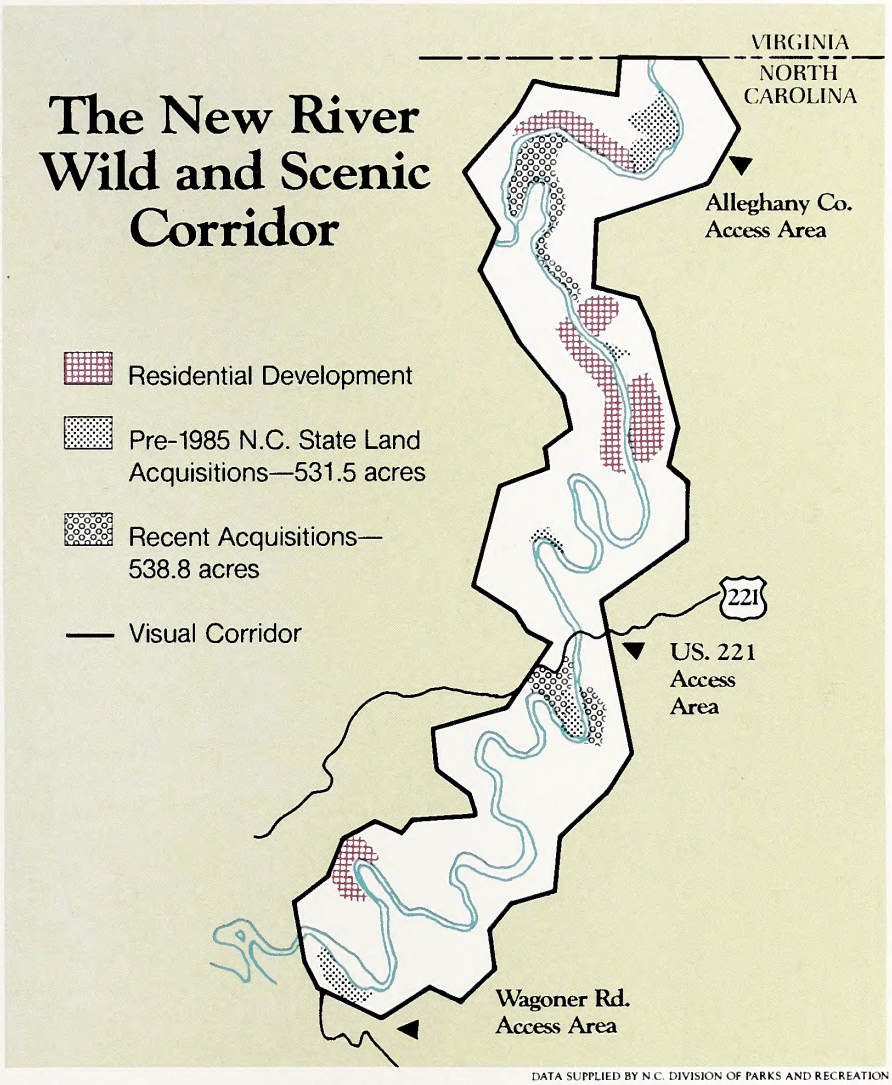
The New River *is one of North Carolina's premier smallmouth bass fisheries and also offers good muskie fishing. Fisheries biologists do not know if increased sediment resulting from development has impacted spawning habitat, but a study is planned.*

Old River, New Trouble

In Ashe and Alleghany *counties, there are currently few restrictions preventing developments such as golf courses or condominiums along the river. Even where development doesn't threaten, the land shows scars from such activities. Trash and other debris (right) washed down from rapidly developing areas like Boone are commonplace along the river.*

Wildlife Commission fisheries biologist for the mountain region. "The increased building and road construction have definitely added sediment to the river. What effect it's had, if any, we don't know yet." Studies will begin next year to monitor the fisheries.

The National Committee for the New and environmental groups like the Blue Ridge Environmental Defense League and the Southern Environmental Law Center are also concerned about a $3.2 million water-treatment plant that the towns of Jefferson and West Jefferson are proposing. If built, this plant could withdraw up to 1 million gallons per day from the river. While the plant would be sited upstream from the Natural and Scenic portion, environmentalists and the National Park Service are concerned about potential impacts large water withdrawals might have on the river ecosystem during low water and drought periods. They also worry the water project could encourage additional development in the scenic corridor area. Currently, the Farmers' Home Administration, the agency considering a preapplication for federal assistance from the towns, is in the process of completing an Environmental Assessment on the proposed project.



DATA SUPPLIED BY N.C. DIVISION OF PARKS AND RECREATION

Standing on the banks of the New, looking up a hill that's been carved, cleared and chopped for development, you can't help but ask: What went wrong with those promises made back in the heady days of 1976?

Much of the problem lies in a lack of funding and structural weakness inherent in the state's Natural and Scenic Rivers Act, said officials with the Division of Parks and Recreation. "The 19-year-old North Carolina Natural and Scenic Rivers System has clearly failed to achieve its purpose of preserving and protecting outstanding state rivers," stated a recent Division assessment of the Natural and Scenic Rivers Act. While the state act offers automatic protection from dams, reservoirs and water-resource projects that have a direct and adverse effect on a designated river, limited land-use controls protect only those riparian lands actually acquired by the state. Also, funds for acquisition are dependent upon appropriations from the Legislature.

By statute, the state of North Carolina is limited to acquiring a total of 2,200 acres on the New, or about one-seventh of the land in the visual corridor. Fee-simple purchases were to be used to buy land at five sites for the New River State Park, while the rest of the corridor was to be protected by narrow buffer strips down the riverbank. In 1977, the Division of Parks and Recreation identified $2 million in land purchases and $4.5 million in capital improvements needed for the corridor. "At that time, that money would have gotten us almost all the land we currently need to protect on the New," said Franklin Boteler, the chief of Outdoor Recreation Planning for the Division of Parks and Recreation. "Unfortunately, that money was never appropriated by the General Assembly."

While some funds dribbled through over the next 10 years, adequate money either was not appropriated or was siphoned off for other projects. "The state failed for years to appropriate needed funds for land acquisition, capital improvements and staffing," the assessment stated. "Resources to support the system have been and continue to be minimal, virtually guaranteeing failure of a system that relies primarily on land acquisition for river corridor protection."

Because of the 2,200-acre limitation and lack of funds, and because the buffer strips were judged too narrow to effectively protect the visual corridor, the state concentrated on acquiring land clustered around the New River State Park's three access areas at U.S. 221, Wagoner Road, and the Alleghany County site. By the end of 1989, only 609 acres of land and 34 acres of easements were obtained by the state.

Last year, as public outcry over development intensified, the entire $2 million appropriated to the Division of Parks and Recreation for land purchases was earmarked for acquisition along the New River. Of that, $1.6 million was spent this spring to buy 350 acres in Alleghany County near the confluence of the North and South Forks from developers already working on a large subdivision. Another 76 acres were purchased at the U.S. 221 site, an acquisition in part funded by a Recreation and Natural Heritage Trust Fund grant. An additional 112 acres were added by condemnation at the U.S. 221 site for public access and park facilities. Negotiations are ongoing for several

Old River, New Trouble

hundred additional acres, say Parks officials, but the state's $500 million budget crisis has torpedoed land purchases for the time being.

The Division of Parks and Recreation has also increased efforts over the last two years to work with the National Committee for the New River to contact landowners along the river and inform them about conservation easements. These easements allow landowners to retain title to their land and continue to farm it but bar intensive development in trade for tax benefits. While 426 acres have been purchased as a result of the program, and another 435 acres are under negotiation, the process is expensive, laborious and typically takes several years to complete.

While it's easy to point a finger at the lack of adequate funding, there's been another important, though less quantifiable, factor working against river preservation efforts. If a man's environment shapes his culture, as historian Frederick Jackson Turner once wrote, then the isolated Appalachians have made the people of the region fiercely independent and suspicious of outsiders, especially those working for "gov'ment."

"While I think most people want the same things we want, many landowners are very distrustful of the state's intentions," Boteler agreed. "This lack of trust has repeatedly slowed negotiations on land-use issues in the corridor."

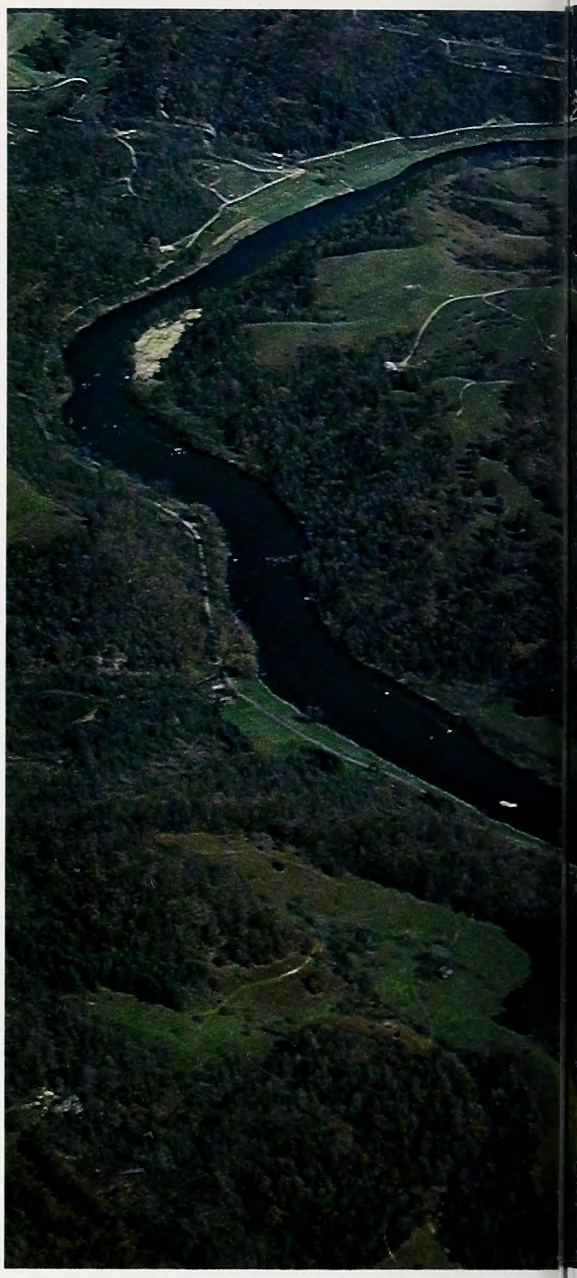
Unlike the Appalachian Power controversy, a galvanized, broad-based front has not emerged to oppose the area's real estate boom. Many landowners along the river simply do not want to negotiate with the state or groups like the National Committee. "A lot of them say they just don't want to be told what they can or can't do with their property," said Randy Revis, a former president for the National Committee for the New.

Ironically, while this desire for independence is an ingrained element of mountain culture, that traditional lifestyle is being threatened as cattle and crops are displaced by vacation homes and a flood of newcomers. "Unless the traditional uses along the New are preserved, these people are going to lose a way of life," Boteler said. What a dam and power company couldn't do, the slick pitches of real estate salesmen may.

In 1989, the New was put on the nation's "10 Most Endangered Rivers" list by American Rivers, a conservation group dedicated to protecting the nation's rivers. By last spring, nearly everyone involved with preservation efforts realized development along the river was reaching a critical stage. "If we don't do something to save this river in the next five years, it will not be worth saving," Stamper said. Employees of the National Park Service were "shocked" and "alarmed," as they put it, at the "uncontrolled development" sweeping the banks of the New.

Since then, the Division of Parks and Recreation has been discussing additional river protection strategies with the National Park Service. The division also planned to develop its comprehensive General Management Plan (GMP) that would re-examine the threats to the river and determine new acquisition and operational needs. Unfortunately, the state's budget crunch has put the GMP on hold this year.

Nevertheless, in its assessment and re-evaluation



of the Natural and Scenic Rivers System, Parks and Recreation has recommended a number of steps that, if adopted, could help save the New as well as other rivers in the Natural and Scenic System. Among the recommendations made:

- Define the goals and objectives for the Natural and Scenic Rivers System.
- Identify the lands that most need protection in the visual corridor.
- Coordinate with other public agencies to protect scenic rivers.
- Employ innovative methods for land acquisition.
- Involve land trust groups like the American Farmland Trust.
- Seek increased appropriations for land purchases.

Landing more money and removing the 2,200-acre limit on land acquisition along the New would be very helpful, say Parks officials, but will not solve the fundamental problem that development poses along the river. "It's clear that relying solely on the state for

acquisition will not provide adequate protection for the river," Boteler said. "There will always be intense competition for limited resources, and obtaining funds for corridor acquisition will never be easy."

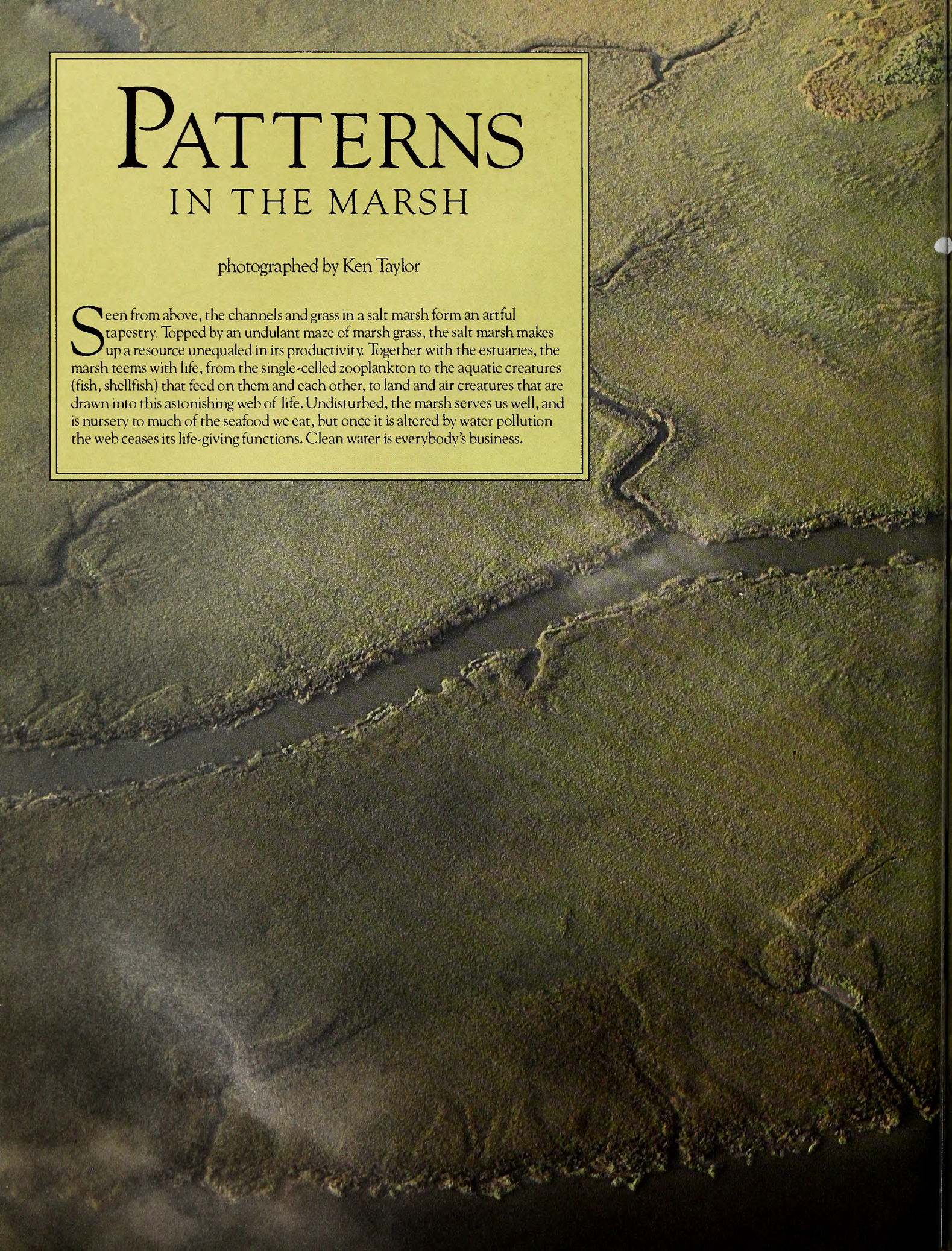
Accordingly, a revamped Natural and Scenic Rivers Act should include some mechanisms for putting in place zoning and land-use controls, say state officials. "North Carolina's river corridors need additional protection. The greatest potential for protecting the river corridor lies in implementing appropriate land-use controls," Boteler stated. The challenge will be finding a way to do this. Getting land-use controls enacted promises to be difficult because of local distrust and the strong desire by many landowners to be unencumbered by zoning regulations, say state officials. Better public involvement in the planning process will be vital to assure local support for river protection, as will incentives to local government, they add. "The state should provide grants to local governments that protect river segments through land-use controls for river planning, river protection, and river access areas," states the assessment.

Local citizens also need to be better informed as to the economic benefits that an unspoiled river contributes to the region, say officials. One estimate has over $9 million per year in tourist dollars flowing to Ashe County alone, much of that resulting from fishing, canoeing and other recreational usage of the river.

But when the banks of the New are crowded with developments, and when the river flows low and dirty and the fish are gone, how many tourists will come?

In the final analysis, unless steps are taken soon, Man will do more to alter the river in the next 10 years than has occurred in past 10,000. After a billion years of existence, time will have finally run out on the New River. In a few more years, perhaps, we'll find ourselves in the same situation as those explorers of 1671, tossing sticks in the water and dreaming of gold. Sadly, that treasure will have been long since swept away. ☒

***The state of** North Carolina recently purchased land at the confluence of the north and south forks of the New River (above), saving the land from a planned subdivision. Because the New is actually older than the Appalachian Mountains through which it flows, the river keeps its twisting, meandering course, a characteristic retained from the age when the terrain was flatter.*



PATTERNS
IN THE MARSH

photographed by Ken Taylor

Seen from above, the channels and grass in a salt marsh form an artful tapestry. Topped by an undulant maze of marsh grass, the salt marsh makes up a resource unequaled in its productivity. Together with the estuaries, the marsh teems with life, from the single-celled zooplankton to the aquatic creatures (fish, shellfish) that feed on them and each other, to land and air creatures that are drawn into this astonishing web of life. Undisturbed, the marsh serves us well, and is nursery to much of the seafood we eat, but once it is altered by water pollution the web ceases its life-giving functions. Clean water is everybody's business.

Top Of The Class

They're the best rivers, creeks and sounds we've got left, and the Outstanding Resource Waters program gives them some muscular protection. Yet, more waters may deserve this protection, and even tougher standards could be needed to keep them free of pollution.

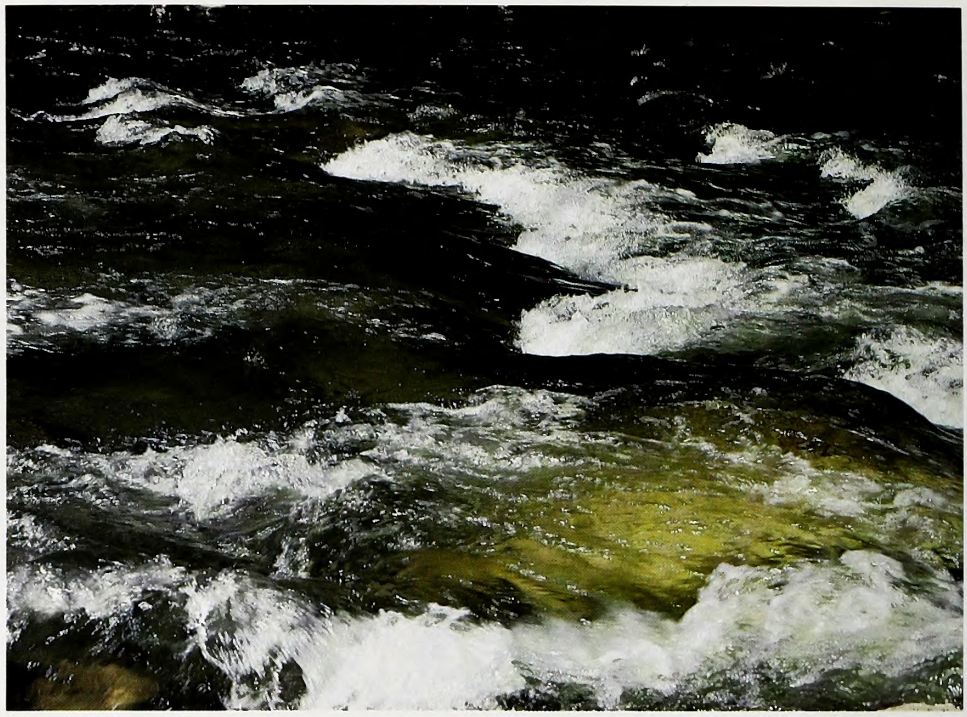
by Lawrence S. Earley
photographed by Ken Taylor

From the banks of a mountain stream these days, the odds are pretty good that you'll hear a kind of music that is neither uplifting nor harmonic. On the one hand are nature's quiet melodies — of water kissing rock, of breeze stirring spruce. Yet more and more these natural sounds are blending with sounds of another kind — of chain saws rasping, of backhoes roaring as second-home developments, roads and golf courses replace natural habitats.

It's the noise of money, as some people tiresomely point out. But to no one's surprise, it's also a discord that threatens some of the best — and some of the last — of the state's pristine waters. For when the engines stop, often what's left is only the memory of a clean waterway. In its place is a degraded stream fouled by discharges from water-treatment plants, by higher temperatures caused by canopy removal, by loads of fertilizers and

***Pristine view of** the marshes behind Bear Island (above) indicates why the area has been designated an Outstanding Resource Water. This water classification offers protection from pollution to the state's best waters. In some coastal ORWs, new marinas (below) are barred to protect the shellfish resource.*

Top Of The Class



pesticides from lawns, golf courses and other developed areas.

That's one reason why pristine and pure waterways are rare and it's one reason why the state, beginning in 1986, introduced a new water classification of "Outstanding Resource Waters" to protect what's left. Twenty-five rivers, sounds and creeks in the mountains and along the coast have been named as ORWs so far (see "The Cream of the Crop"). They range in size from the 8.5-mile Gipp creek in Cherokee County to the 74,400-acre Core Swamp in Carteret County. They're the cream of the crop, North Carolina's finest waterways, and now they'll get some of the best protection the state can offer.

Though many conservationists see flaws in the ORW program, most are enthusiastic over its potential. "I think it's an extremely important step forward for North Carolina," says Charles Peterson, a marine biologist with the UNC Institute of Marine Sciences in Morehead City and a member of the Environmental Management Commission, which designates ORWs. "It's high time we got past that stage of almost unregulated watersheds, especially in the mountains, and went on to examining what goes in our water to maintain the values they represent."

"Outstanding Resource Waters" is only one of a number of classifications assigned to state waters according to their best uses. Every river, creek, sound or reservoir has a classification of some kind that specifies what those uses are and assigns standards for their protection. If the water is being used as a municipal water supply, for example, it needs higher standards than if it's being used for swimming and fishing. Commercial shellfishing waters also have higher water-quality standards than other saltwater areas.

In addition, supplemental classifications are attached to waters to do other things, according to Greg Thorpe, supervisor of the Water Quality Standards and Assessment Unit with the Division of Environmental Management. "They may designate a water body as sensitive to nutrients, in which case it gets a 'nutrient sensitive water' (NSW) classification entitling it to additional management strategies. Or, the classification can recognize a certain resource-related use, such as trout waters (Tr), which would protect the propagation and maintenance of trout."

Two other supplemental classifications, "high quality waters" (HQW) and "outstanding resource waters" (ORW), recognize rivers, creeks and sounds with the best water quality or with special uses that need to be protected. But an ORW differs from a HQW because it possesses at least one of a number of special ecological or recreational values that need protection: (1) an outstanding fishery or fish habitat; (2) significant recreational value; (3) a special designation already attached to the river, such as a state or national wild and scenic river classification, national wildlife refuge, or some other designation. Or it may be (4) a component of a state or national park, or may have (5) some special ecological or scientific significance, such as an area used for research and education.

In Burke County, for example, Henry Fork was named an ORW because of its excellent water quality, its diverse fish community and an unusually high level of water-based recreation. It also provides habitat for several rare and endangered plant and animal species. Core Sound, including the Southeastern Pamlico Sound and Back Sound area, supports critical fish and shellfish populations, including North Carolina's entire population of bay scallops. It's also an important research area and is partially bounded by Cape Lookout National Seashore and the Cedar Island Wildlife Refuge.

Communities have rallied behind ORW nominations and for good reason. An ORW gets some of the best protections the state offers. First, no new discharges of any kind are allowed. This restriction protects the water from "point-source pollution," or pollution that enters the river from a single point, such as a water-treatment plant. "ORW classification really tightens up on discharges into rivers," says N.C. Wildlife Resources Commission biologist Joe Mickey. "There are other ways to treat that sewage and developers have to find ways of doing that."

There's protection against non-point-

***To protect its** high-quality rivers, streams and sounds, North Carolina has developed two supplemental water classifications in recent years: Outstanding Resource Waters and High-Quality Waters. Waterways so designated have excellent water quality, but an Outstanding Resource Water also has high recreational or ecological values that need to be protected.*

***Parking lots and** other paved and cleared areas often channel pollution-laden rainwater to sensitive waters. To protect ORWs against this kind of non-point-source pollution, wet-detention ponds like the one below are required for some large developments. These enable pollutants to settle before the water is released.*

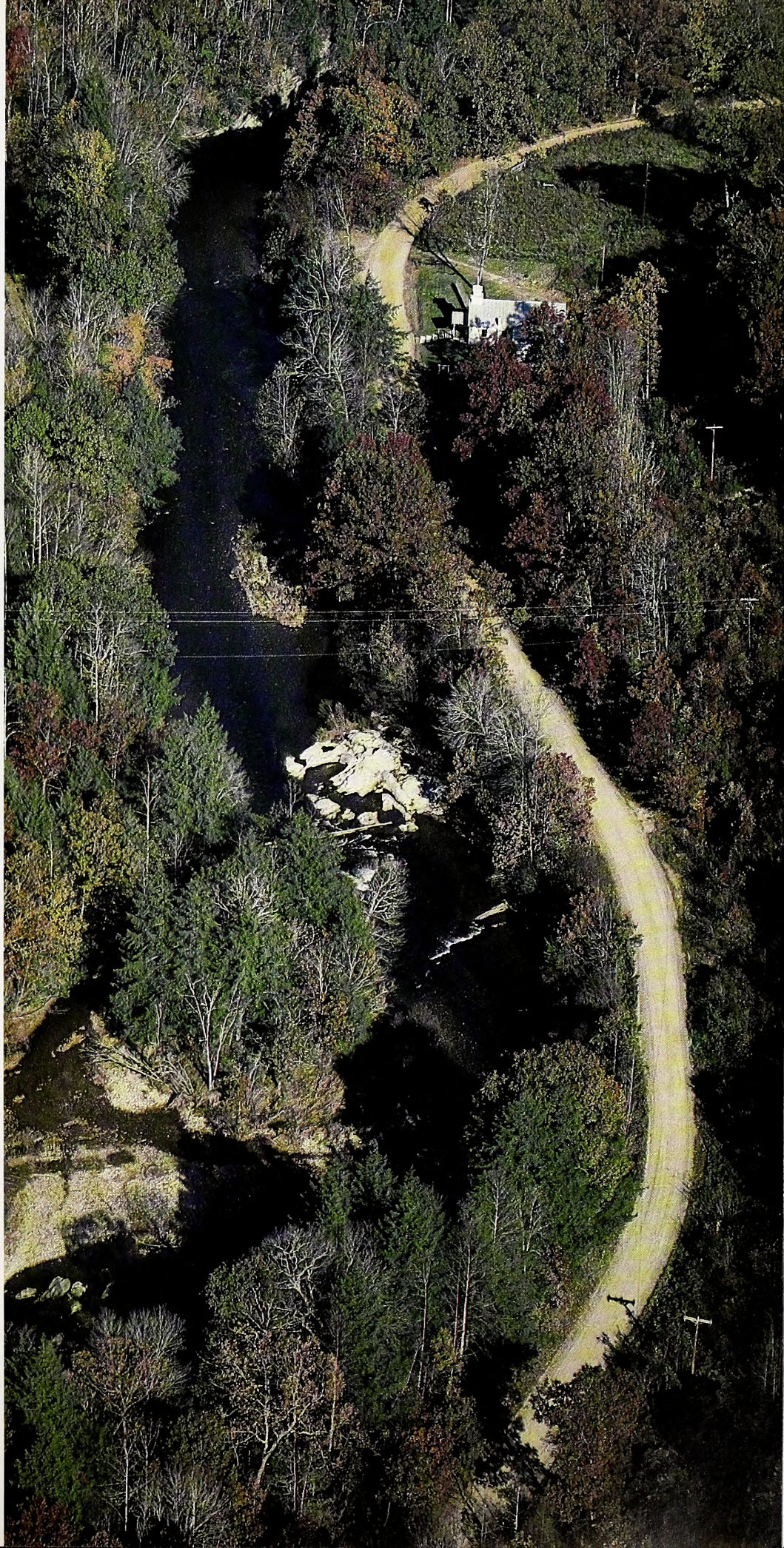
source pollution as well. This is the most common form of pollution, often the result of runoff from farmland, feedlots, parking lots, roads and other cleared and paved surfaces. Rainwater falling on these surfaces is less likely to be absorbed by the ground and more likely to flow directly into rivers. When it does, it may carry different kinds of pollutants, depending on where it's coming from: leads associated with cars; fertilizers and pesticides from lawns and farms; or sediments from construction activities. To reduce this kind of pollution, developments in ORW watersheds must limit the amount of hard-surface areas or incorporate engineered stormwater controls, such as wet detention ponds, into the project.

In coastal ORWs, in addition, there may be restrictions on the construction of new marinas, a growing source of pollution in coastal waters. Plus, the protection offered each ORW is, to a certain extent, individually tailored to protect its chief values. And the protections can be tightened up. "It's a federal requirement that our standards and rules are reviewed every three years," says Thorpe. "So if we see that something isn't working, the EMC has ample opportunity to fix that."

So if ORWs reduce pollution in pristine waters, create public awareness of the values of local rivers or sounds, and provide a dynamic framework for fine-tuning the protection, why doesn't everybody love them?

Perhaps the one criticism that DEM officials hear the most is that ORW classification reduces the value of property adjacent to ORW waters and can stifle development. A good case in point, these critics maintain, is the Alarka Creek incident. This past April, Alarka Creek in Swain County was nominated as an ORW. The nomination occurred at the same time that an investment group was negotiating to buy and develop a large tract of land adjoining the creek. Because an ORW carried more restrictive environmental requirements than the creek then had, the group backed off.

The departure outraged Swain County officials and citizens. At public hearings required as part of the ORW nomination process, these officials complained that the ORW nomination had scared away a development that would have provided jobs to the economically depressed county. As a result of the hearings, Alarka Creek was designated as



The South Toe River *in Yancey County was the first river to be named an ORW. This mountain stream offers an excellent trout fishery, one of the important natural resources that the designation protects.*

Top Of The Class

an HQW rather than an ORW.

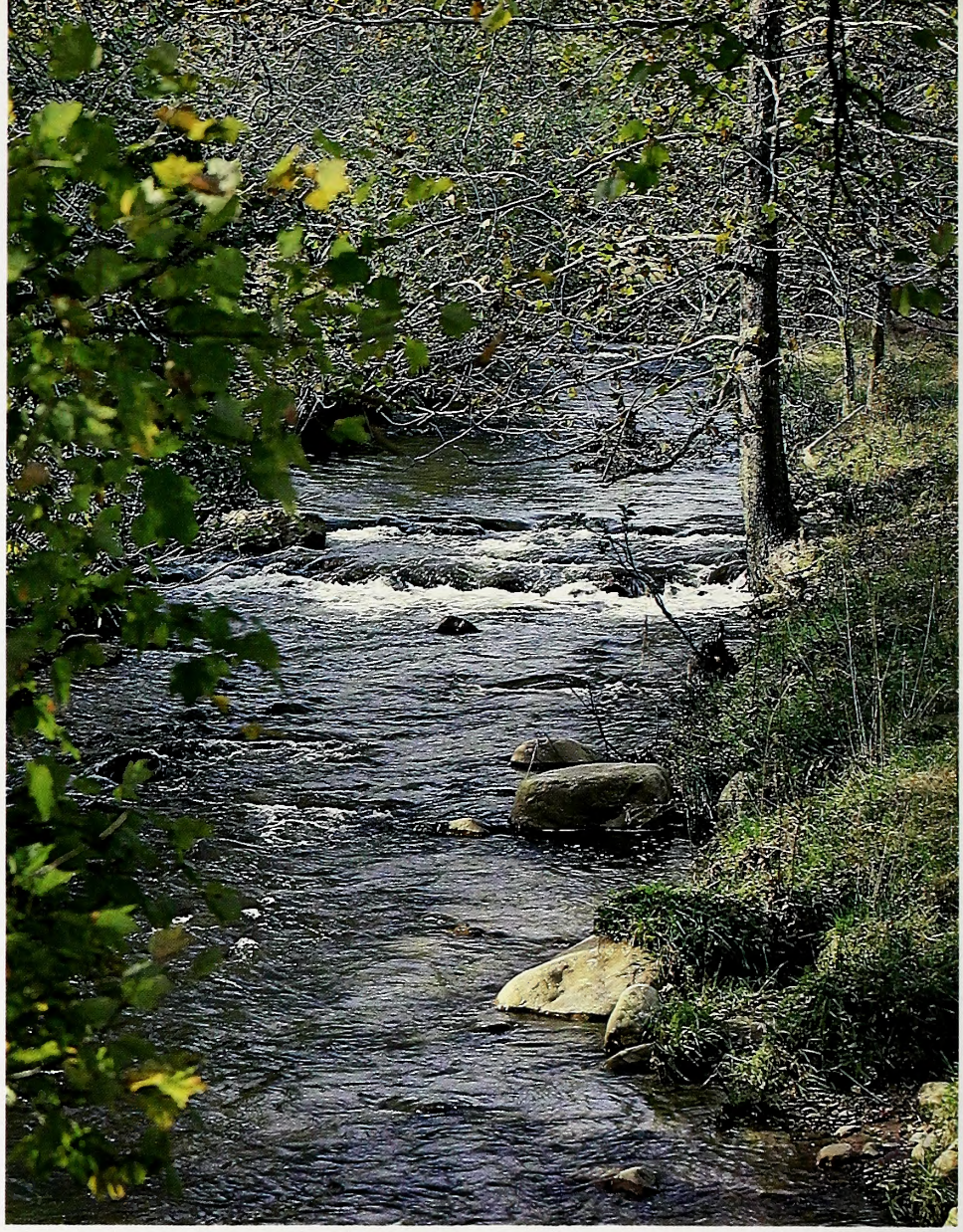
Is ORW classification bad for business? No, says Forrest Westall, regional water-quality supervisor for DEM in Asheville. "I don't think that any project that is proposed would be blocked by ORW or HQW classifications," he says. "What we're asking is, if you're planning on building on an ORW or HQW water, do it so that it has a minimal impact on the water. In the short term there may be delays, but if developers look into it in enough detail, and with enough technical support from their engineers and architects, and if they talk with us, then I do not believe that any project that is proposed would be blocked by an ORW or HQW."

"We're trying to protect the water quality of the stream, not trying to tell people what they can do with their property," he adds.

On the other side of the coin, some say that ORW protections are painfully limited. One reason is that though ORW protections reduce pollution from some sources, they have no effect on others.

Some of these limitations were made frustratingly clear in 1988 by a notorious case in Alleghany County, in western North Carolina, involving a golf club development called Olde Beau. Siltation from construction activities at the development destroyed the trout fishery in one creek, Laurel Branch, and severely damaged the headwaters of Mitchell River, which had been recently designated an ORW. "Here was the Mitchell River declared an ORW and a month later it was pretty severely damaged by the development," says Joe Mickey. "They really didn't have a whole lot of control over that."

"The Olde Beau project typified a situation where a developer could follow the technical requirements of the law and still create a great deal of problems for a river," says Charles Brady of Lenoir, a member of the Environmental Management Commission. The developer could clear land without storm-water controls on the headwaters of an ORW because the Sedimentation Pollution Control Act (1973) exempted farming, logging or mining operations from the provisions of the act, which requires an erosion-control plan before land can be cleared. The developer claimed a logging exemption, a loophole that has been consistently exploited by developers, especially in the mountains, permitting them to bypass environmental safeguards.



Named an ORW *in 1988, the Mitchell River (seen above before it was heavily silted) was almost immediately affected by sedimentation from construction activity on its headwaters (below). Lack of erosion controls wrecked the trout fishery from one stream, Laurel Branch, and severely damaged the Mitchell River. The notoriety of the case caused state agencies to tighten up laws controlling sedimentation pollution.*

At least partially as a result of public outrage over the degradation of the two waterways, and subsequent litigation, Rep. Marie Colton (D-Buncombe) introduced new legislation during the 1989 session of the General Assembly that has tightened up some of these loopholes. To claim an exemption now, developers and loggers must institute best management forest practices and a modest fine has been established for violations.

But beyond the loophole, Olde Beau pointed out a serious dilemma for the Environmental Management Commission as it sought to provide protections for ORWs. "Because the EMC manages water quality and sedimentation is under the Division of Land Quality, the EMC has very little oversight over sedimentation," says Brady. Adds Charles Peterson: "It's a source of frustration when you're on a body like the EMC and you can only manipulate some of the factors leading to pollution."

This flaw in ORW protection was seized upon last summer by coastal developers who

claimed that ORW restrictions unfairly targeted development while ignoring other sources of pollution such as agriculture, forestry and certain kinds of fishing practices. In some coastal waters, agriculture by itself contributes more pollution (sedimentation, pesticides) than any other source but is exempt from many environmental laws. It's a situation that many observers think must be addressed.

"The ORW classification was one way to control one source of degradation, one source of pollution," says Mike Corcoran, executive vice president of the N.C. Wildlife Federation. "But it's very clear now that agriculture and other non-point-source pollution must be dealt with. It's very clear that forestry, both in the timber-growing and the timber-harvesting phases, as well as in the pulp-mill phase, also has a major impact on our water."

Other coastal critics of ORW protection say that restrictions on development are not enough to protect the quality of the water. The seven coastal waters named as ORWs comprise some of the most pristine shellfish habitats left in North Carolina, but the coast is exploding with development, threatening some of them with bacterial contamination from urban and residential runoff, discharges from leaking septic tanks and marinas. "A few years ago, heavy rains didn't affect our shellfish waters that much," says Bob Benton, head of the Shellfish Sanitation Branch, with the Division of Environmental Health. "Today with all the land that's being cleared, ditched, paved and built upon, we're getting more runoff into coastal waters, more pollution and more temporary closures of shellfish waters." Not suprisingly, most closures occur in areas with the greatest population growth.

ORW classification attempts to protect these coastal waters chiefly by limiting the built-upon area to 25 percent of the 575-foot buffer zone adjoining the water. That's too much construction, says Todd Miller, director of the North Carolina Coastal Federation. "The basic flaw in ORW protections here is that they are inadequate to achieve the level of protection that the standards call for," he says. He cites the Pine Knoll Shores community at the eastern end of Bogue Sound, just outside of the ORW portion (Western Bogue Sound), where the state closed the shoreline to shellfishing because of stormwater runoff. Those were waters that were not far off from being ORW quality, Miller notes, and Pine Knoll Shores is built upon only to a 17-percent density. Miller says that limiting development to 12-15 percent of the buffer zone would do a better job of protecting the waters.

"People and clean water don't really go together," says Miller. "If you put a Wrightsville Beach next to one of these ORWs, you're not going to have clean water any longer. So if we're serious about protecting these areas, we have to control the density of land use so that the land can soak up the contaminants that people put on them before they reach the water."

These criticisms of the ORW program are hardly quibbles, yet no one doubts that it will go a long way toward meeting the state's goal of identifying and preserving its pristine waters. It's a goal that means a lot to many North Carolinians, for whom a river or creek isn't just a dumping ground but a source of life, pleasure and quickening memory. Said one man at an ORW public hearing:

"I don't have to have a report or anything else to tell me how clean and beautiful my little river is. I know how much my children and my family have enjoyed it and I hope that in the years to come that I can tell my grandchildren and great-grandchildren that we worked hard to preserve that river for them."

He speaks for many in North Carolina who believe that clean water ought to be a right, not a privilege. ⊠

Cream of the Crop

While 25 waters have been listed as ORWs so far, more are being nominated. Anyone can nominate a water body as an Outstanding Resource Water, as long as it meets the criteria for the classification: excellent water quality and at least one special ecological or recreational value. Public hearings are held to debate the designation and the Environmental Management Commission makes the final decision.

The first ORW named, in 1987, was the South Toe River in Yancey County. The last to be named, in April 1990, was Naked Creek, in Richmond and Montgomery counties.

Here is the list of ORWs as of June 1990:

Water Body	River Basin
Stump Sound	Cape Fear
Middle and Topsail sounds	
Masonboro Sound	
Wilson Creek	Catawba
Henry Fork	
Jacob Fork	
Upper Creek	
Steels Creek	
South Toe River	French Broad
Cataloochee Creek	
South Fork Mills River	
Fires Creek	Hiwassee
Gipp Creek	
Chatooga River	Little Tennessee
Nantahala River	
Naked Creek	Lumber River
Neuse—SE Pamlico Sound area	Neuse
Alligator River	Pasquotank
Swanquarter and Juniper Bay area	Hyde
Roosevelt Natural Area	White Oak
Core and Back sounds	
Western Bogue Sound and Bear Island area	
Mitchell River	Yadkin
Elk Creek	
Barnes Creek	

Peace Eagles

Are vultures merely ugly scavengers with a disgusting way of fending off threats? Or are they soaring symbols of mankind's greatest dream?

by Doug Elliott ©1990

One sunny spring day I decided to explore an abandoned old barn at the edge of a woods. I was climbing into the attic when I heard a ghastly sound — a breathy, guttural growl — that came from a dark corner where the roof met the attic floor. It had a threatening quality to it and part of me wanted to bolt out of there. But I just couldn't leave. I had to know what could emit such a dreadful noise. Warily I crouched down and waited till my eyes adjusted to the light. There, huddled in the corner, was a baby bird covered with soft fuzz as white as swan's down. This was no ordinary baby bird, however, but a giant, gawky-looking creature with a hooked bill. It was almost as large as a chicken.

I had blundered onto a vulture's nest and this young vulture was doing its best to encourage me to blunder right on back where I came from. That's just what I did. And after I learned of a certain unique defense mechanism used by vultures, I'm glad I did. As helpless as they are, young vultures have one very effective deterrent in their arsenal. Had I approached much closer, that soft, downy baby bird would have puked all over me! A vulture can expel a load of vomit 2 or 3 feet with considerable force and accuracy.

Buzzard puke as the ultimate weapon — what a concept! When I first learned of this, all I could think of was how the divine creator must have an outrageous sense of humor. Yet, as I investigated further I found that vomiting in vultures is all part of an elegant plan, this particular adaptation notwithstanding. Vultures, as adept as they are at gliding and soaring, are awkward and ungainly on the ground. They have weak flapping muscles and can take off from the ground only with great difficulty. By emptying the contents of its crop into the face of a potential predator, a vulture can reduce its weight significantly, enabling it to take off more quickly. The indignity of such a gesture is not the only problem for any assailant unfortunate enough to catch such a load. There will also be a sharp burning sensation wherever any of the vulture's powerful digestive juices touch bare skin. One vulture's victim summed it up like this: "When you been puked on by a buzzard you KNOW you been puked on!"

This behavioral characteristic has spawned a strange bit of folklore. Because of this legendary proficiency at vomiting, some folks believe vultures have no anal opening and cannot defecate like other birds.

I once heard a humorous conversation between two old-timers who were discussing vultures, and it was not long before they got to this particular aspect of vulturine anatomy. One of them was saying, "Them buzzards don't have that feature." He kept adamantly insisting this was true, until the other one said, "Well, if that's true, then tell me how they lay their eggs." Well, that stopped the first man in this tracks. He hadn't ever considered that. The second fellow kept chuckling and added, "Now buddy, that's something I'd like to see — an ole' buzzard just a burpin' up them eggs!"

As it turns out vultures do defecate and lay eggs like other birds, but not, of course, from the same opening. They breed in the spring and raise one brood a year, laying between one and three (but usually two) eggs. They nest not only in deserted buildings, but also in hollow stumps, in cavities in cliffs, in old nests of hawks and sometimes directly on the ground. Occasionally, several pairs will nest in a colony.

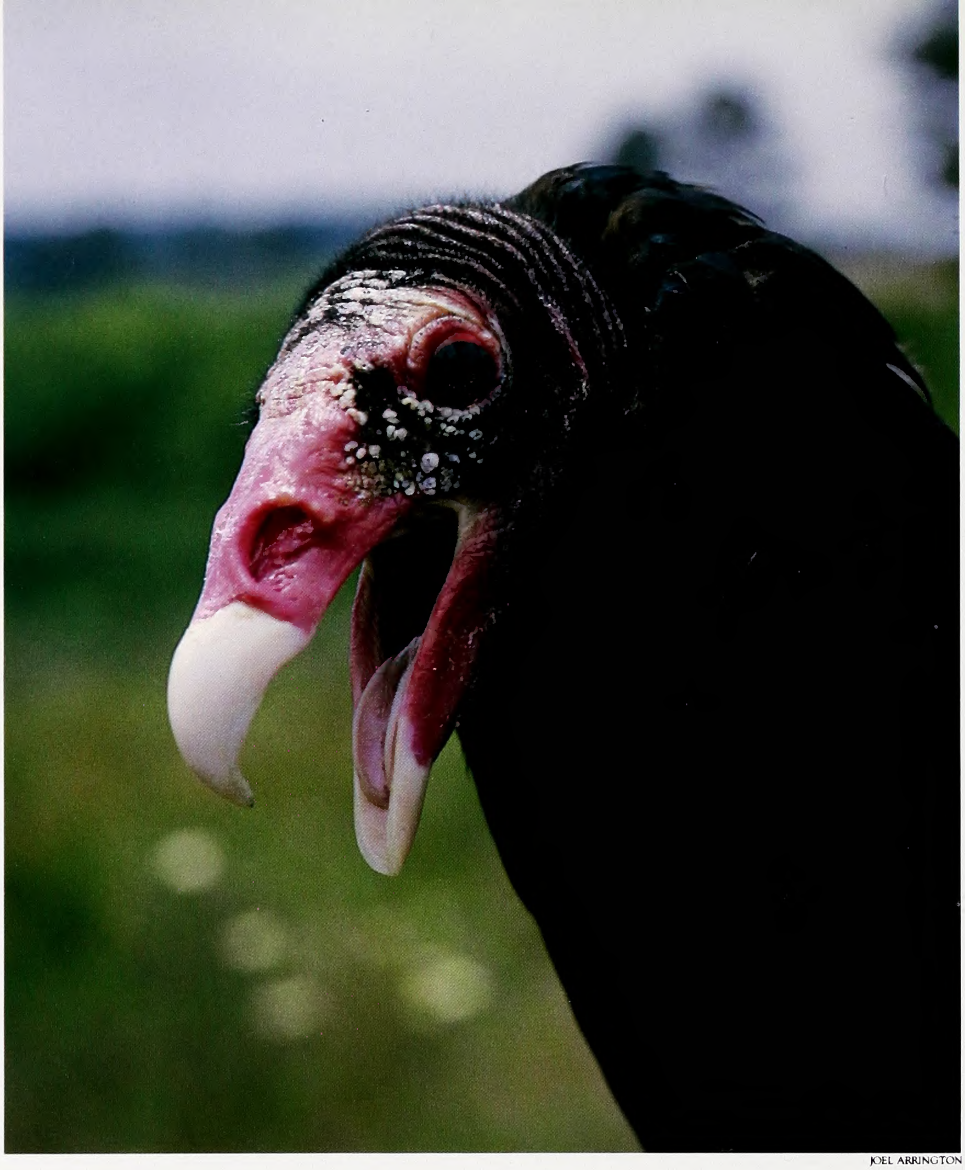
The forests that provided hollow logs and other undisturbed nest sites have been disappearing, however, and even many of the abandoned barns that vultures used several decades ago have fallen down. Because of this scarcity of nest sites, vulture populations are declining in North Carolina and both the turkey vulture and the black vulture — while not classified as endangered species — have been declared species of special concern by the N.C. Wildlife Resources Commission.

Although you might see either species of vulture anywhere in the state, the black vulture is less common in the mountains. When they are both seen flying together, the black vulture can be distinguished from the turkey vulture because it flaps more often and has white patches under its wings, a shorter tail and a black head. The turkey vulture has a red head (when mature) and its wings form a slight dihedral (a shallow "V") when it is soaring.

Vultures are famous for their seemingly effortless flight. You can watch a vulture for hours and never see its wings flap. A vulture's physical structure is aerodynamically ideal for soaring, and its large size gives it stability and momentum to carry it through erratic air currents. The width of the wings gives maneuverability, which is particularly important because vultures must be able to circle in tight spirals within the often small and undependable pillars of rising warm air. The broad, high-lift wings have slotted fingerlike primary

***This turkey vulture** has broad wings with finger-like primary feathers at each wingtip that can be individually adjusted for maximum lift. Although not fast flyers, vultures are extremely maneuverable, allowing them to stay aloft on thermals and other air currents.*

LEONARD LEE RUE III



JOEL ARRINGTON

The turkey vulture *is by no means just another pretty face, but it is well adapted for feeding on carrion. Large nostrils help this scavenger locate rotting carcasses, its hooked beak tears flesh easily, and the featherless head stays clean during feeding. Populations of both turkey vultures and black vultures (below) are declining because of habitat alteration.*

LEONARD LEE RUE III

feathers at the tips. Each separately extended primary feather acts as a narrow, high-aspect wing and each feather can be set at a steep angle for maximum lift. This adapts vultures ideally to high-altitude, low-speed soaring.

Gliding was probably the original form of bird flight, and it is still the simplest. Soaring flight is only slightly more complicated, permitting vultures and other soaring birds to maintain or increase altitude without flapping their wings by riding updrafts.

Vultures exploit two basic types of air currents: obstruction currents and thermals. Obstruction currents are updrafts that occur when a prevailing wind strikes and rises over objects such as hills or buildings. Wind coming down the lee side of a mountain may strike the plain and rebound in a series of "standing waves," very much like water flowing over a large rock in the rapids of a white-water river. Each of these waves has an updraft, and when you see vultures soaring along the edges of ridges and bluffs, it is most likely the updrafts they're riding are from obstruction currents.

Sometimes you may see a number of vultures circling over a field, probably because they have spotted something to eat on the ground. While circling, they are most likely riding a thermal. Thermals (sometimes called convection currents) are updrafts caused by the uneven heating of the air near the surface of the earth. The air over cities, bare fields or rock faces heats more quickly than that over forests or bodies of water. Since warm air expands and is lighter, it rises above denser cooler air. Thermals are usually local disturbances in the form of slender columns or huge bubbles of rising air. These thermals are the domain of the vultures and other soaring birds. This is where they spend most of their waking hours, where they are the safest and are most at home.

A few adventurous scientists have studied the flight of vultures from motorless sailplanes. Not only is this an ideal observation platform for watching the vultures, but in order to stay aloft the observer must also search out and use the same currents of rising air. With their immense wingspans, sailplanes can glide farther and faster than a vulture, but they are less maneuverable than the birds.

Speed is not as useful to a vulture as maneuverability. A vulture's ability to fly slowly allows it to fly in the tight circles necessary to take advantage of narrow thermal columns.

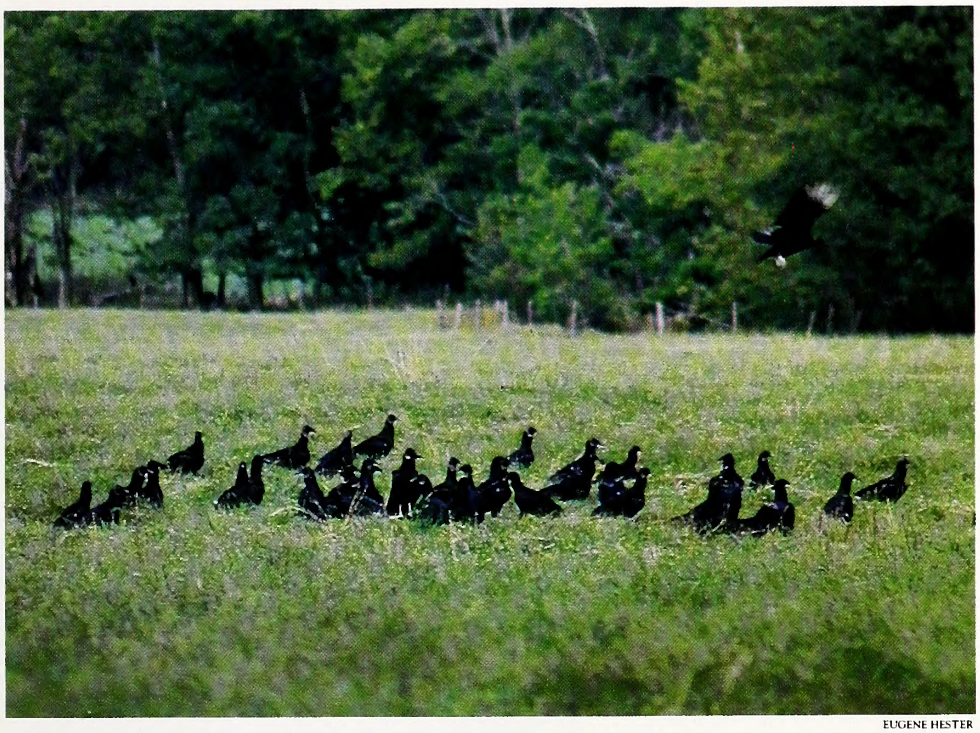
In order to soar on a mass of rising air, it is essential that the sinking speed of a bird be no greater than the rate of rising air in the thermal. Sinking speed is the rate at which a bird would fall if dropped with its wings spread (not flapping) through absolutely calm air. This all sounds rather theoretical, but the observers in those sailplanes were able to calculate that the sinking speed of a turkey vulture is 2.28 kilometers per hour and that of a black vulture is 2.83.

These differences in the sinking speeds of our two species of vultures show that the black vulture, even though it is about the same physical weight as the turkey vulture, is aerodynamically inferior. This small difference affects the geographic ranges of the species strikingly. The range of the more buoyant turkey vulture extends up into the cool North as far as southern Canada, while the black vulture is restricted to the southern half of the United States and southward into the tropics, where the strong sun generates many more vigorous thermals.

By traveling from thermal to thermal vultures can travel hundreds of miles a day while expending very little energy. They can be seen spiraling upward in the midst of a column of air until they are high in the sky, then heading off in their intended direction gliding slowly downward until they find another thermal in which to gain altitude. How they can tell where to find the next thermal is somewhat of a mystery, but it is known that they have sharp eyesight and watch each other carefully. When one vulture starts ascending on a thermal, other vultures in the area sail over and they all rise together.

Vultures use their powerful vision to locate food as well. They are scavengers and their diet is almost entirely carrion — dead animals. They are as well designed for scavenging as they are for soaring. The bald, featherless head, as ugly as it may seem to us, is an elegant adaptation. When a vulture plunges its head into a succulent, putrid carcass, it has no head feathers to soil.

Few birds use their sense of smell to locate food and, for many years, ornithologists speculated whether this was true of vultures. Researchers conducted a series of experiments by watching concealed animal carcasses. While not as exciting as soaring in thermals in a sailplane, it permitted some interesting observations. They found that turkey vultures would definitely come to investigate the smell of carrion and the more ripe the hidden carcass, the faster the vultures would appear. However, it was discovered that black vultures have little or no sense of smell and would come to the bait only if they could see it or if they could see other vultures swooping down to feed.



EUGENE HESTER

***Vultures serve as** nature's sanitation engineers. Because they feed on dead animals, they clean up rotting carcasses that might otherwise pose health hazards. This flock of black vultures is descending on a dead calf.*

Many people have little regard for vultures. Because of their diet, they are thought of as little more than filthy vermin. Some people even consider them omens of death. Of course, it is this diet that makes them an important link in the chain of life on earth. Vultures are part of nature's sanitation system. They quickly clean up any dead animals that if allowed to lie and rot might be a health hazard.

In Cherokee mythology the Great Vulture played an important role in the shaping of the earth. When the earth was new, the Great Vulture flapped its mighty wings and where its wingtips struck the ground they formed the mountains and the valleys that constitute the heart of traditional Cherokee territory.

Vultures are also seen as medicine animals by the Cherokee and other Native Americans. Because they can thrive on carrion and decay, vultures are believed to have immunity from sickness and disease and are important spirit allies or totems for medicine people, who often wear vulture feathers. In certain traditional Cherokee ceremonies, a small quantity of the vulture's flesh is eaten, and medicine is blown onto wounds through the hollow part of a vulture's quill. Vulture's down is then placed over the wound to stop bleeding and promote healing.

Once I found the bones of a large bird in the woods. Although the skull was not there, I did find a portion of the lower jaw. I could tell from the curvature of the jaw that it was from some kind of bird of prey. I kept the bones with me for awhile and puzzled about their identity. One day I ran into an Indian from the North who was a native speaker of various Algonquian languages. I asked him about the bones. He looked them over thoughtfully and said, "I wonder if they could be from a peace eagle."

"A peace eagle?" I asked. "What's that?"

"Oh, it's a big eagle," he said, "almost as big as the white-headed eagle. It has fingers at the ends of its wings. It circles in the sky above peace encampments."

As he spoke, my birder's brain was rattling up and down mental checklists of northern raptors trying to figure what species he could possibly be talking about.

"Why do you call it a peace eagle?" I asked, groping for a clue.

"It brings an element of peace to a tribe of warriors."

"How so?"

"It doesn't kill," he said. "It only eats animals that are already dead."

"Does it have a naked head?" I asked, finally getting the hint.

"Yes, that's him," he replied.

I knew I would never look at an ole' buzzard the same way again.

Doug Elliott's most recent book, Woodslore and Wildwood Wisdom, *can be ordered from him at Possum Productions, Rt. 1, Box 388, Union Mills, N.C. 28167 for $10 postpaid.*

Hunters Responsible for Own Actions

Take Precautions to Avoid Hunting Baited Areas

Written and Edited by Vic Venters

KEN TAYLOR

Baiting Blues: *Federal migratory gamebird law states that hunters have the responsibility for determining if a field where they are planning to hunt doves has been baited. By learning the regulations and following some simple precautions, sportsmen can avoid baited areas. Hunting over fields harvested by legitimate agricultural methods, as pictured above, is perfectly legal.*

For many wingshooters, the opening day of dove season in September is one of the most eagerly anticipated events of the year. There will be plenty of birds and lots of friends, a perfect recipe for a good dove hunt. There are, however, a few things you need to remember. Aside from practicing safe shooting techniques, obeying bag limits, and making sure your gun is plugged for three shells, hunters also need to know that the fields they are hunting are not baited.

Under federal migratory gamebird law, it is the hunter's responsibility to find out if a field has been baited illegally to attract doves. Under these regulations, a court may find the hunter guilty of shooting over bait without having to prove the violator had knowledge that the field was baited. While the law has been controversial at times, it was enacted to prevent practices that are harmful to the resource.

"We caution hunters to realize that it is their responsibility to know if an area has been baited," said Col. Harold Ragland, chief of the N.C. Wildlife Resources Commission's Division of Enforcement. "Hunters should always take some precautions and ask questions before hunting over fields that they have not managed themselves."

Never hunt over an area you know has been baited. Baiting is defined as "any area where shelled, shucked or unshucked corn, wheat or other grain, salt or other feed whatsoever capable of luring, attracting, or enticing birds is directly or indirectly placed, exposed, deposited or scattered."

Additionally, state and federal regulations prohibit hunting over a "baited" area for 10 days after the bait has been removed because doves habitually return to the same area after their food supply no longer exists. North Carolina also prohibits hunting within 300 yards of a baited area.

Hunters may legally hunt doves over fields prepared by "bona fide agricultural practices," which means normal and legitimate farming techniques. By this, hunters can shoot doves over standing crops, grain crops properly shocked on the field where grown, or grains accidently scattered solely as the result of normal planting or harvesting. Hunting is also allowed in fields where cattle and livestock have been allowed to feed.

Nor does the law prohibit taking doves over crops grown for wildlife management purposes, provided that "manipulation for wildlife management purposes does not include the distribution or scattering of grain or other feed once it has been removed from or stored on the field where grown." In simple language, this means dove hunting is allowed over fields where the crop was mowed, bush hogged or knocked down as long as it is not harvested and redistributed on the field.

There are certain things to look for when hunting an unfamiliar piece of property. One of the most common baiting violations is hunting over fields that are baited under the pretense of having been "planted" for crops. If you are hunting over fields that have been recently planted according to bona fide agricultural practices, you've got nothing to worry about. However, hunters should not hunt in fields planted with one crop that have other grains or rock salt scattered about. These fields are baited. Hunters should also look for grain concentrated in clumps and piles or in thick strips. If you observe these, don't hunt that field.

Also, crops such as millet or sunflower cannot be top sown; however, wheat can be top sown. Usually, 1½-bushel of wheat sown per acre is considered bona fide agricultural practice. One cannot hunt over fields that have been sown several times in quick succession or those having grain amounts that exceed bona fide agricultural practice.

If you are preparing or planting a field that you later plan to hunt, the key to understanding the law is to know what constitutes "bona fide" and accepted agricultural practices in your region. For more information on accepted practices, contact your local County Agricultural Extension Office. Remember, when it comes to baiting and the law, ignorance is no excuse.

Fallen Trees Are Fire Hazard

Timber Damaged by Hurricane Hugo

Clearing your land for reforestation may not seem an appealing prospect if you lost a lot of timber to Hurricane Hugo last September, but avoiding it could create more problems in the future.

The storm ravaged over 2.7 million acres of North Carolina timberland, and the resulting tangle of downed trees and other forest fuels, such as pine needles and leaves, has created an unprecedented fire hazard. Leaving timber where it fell could be an invitation to further destruction. Although there is a continuing effort to open access roads, many are still blocked, which makes conventional firefighting efforts extremely difficult or impossible. The fire threat will continue for the next three to five years until the downed timber decays.

One way to reduce the amount of fuel is to salvage the downed timber. If you have a stand with more than 50 percent damage, it may pay to invest the time and effort seeking salvage opportunities. Despite a temporarily glutted market, timber salvage is continuing throughout Hugo-damaged areas. Those who wait too long may be left with timber that is too deteriorated to sell.

It's important to be persistent; markets fluctuate, and someone who isn't interested in your timber now may be later. Besides the advantages of reduced forest fire dangers and an opportunity to generate income, salvaged land is easier to prepare for reforestation.

Pay close attention to how someone who contracts to do salvage work on your land plans to minimize soil erosion and stream sedimentation. "All salvage or regeneration activity should be protective of water quality," said Fred White, assistant state forester, who added that salvage operations should provide an undisturbed buffer along streams and lakefronts.

After consulting a forester, you may decide that controlled burning is your best option for reducing wildfire dangers on your property. A controlled burn is a fire that has been deliberately set in a specific area under selected weather conditions. Only someone with the appropriate experience, and an understanding of your forest management objectives, should oversee a controlled burn.

If you want to create a stand of higher-value timber for the future, reforestation should be your goal. Be sure to ask your county ranger about state and federal cost-sharing programs that pay up to 40 percent of your reforestation expenses. Many landowners, by their lack of action, have left the reforestation task to nature. Although natural regeneration may make the most sense in some cases, most landowners will benefit far more if they invest some time and money in site preparation.

The Division of Forest Resources wants to help landowners manage their woodland, based on their needs — which can range from a desire to attract wildlife to timber production. If you need advice on managing your Hugo-damaged land, contact your local county forest ranger or the Forest Extension Service and ask for a free on-site examination of your woodlands.

— Mandy Matson

Pulled Like "Mud Turtle"

New State Record Rainbow Trout Caught

Ernest Hemingway once described fishing for giant rainbow trout as a "wild and nerve-frazzling sport, second only in strenuousness to angling for tuna off Catalina Island." Hillard D. Houston, the new record holder for the state's biggest rainbow trout, might agree with Papa but described his record-breaking fish in somewhat different terms. "I thought I hooked a big mud turtle," he said of his initial reaction when he tied into the 14-pound 8-ounce rainbow that broke the old record.

The big, hook-jawed bruiser fell to a piece of corn fished in a pool on Ray Creek in Macon County last November 10. Houston, whose spin-cast reel was equipped with 10-pound test line, said he fought the rainbow for 35 or 40 minutes before subduing it. Houston's rainbow broke a 40-year record, topping the 14-pound, 1-ounce rainbow caught by Max Rogers on Glenville Lake in 1949.

While our mountain lakes produce some large trout, North Carolina's small, freestone streams rarely produce large rainbows. Because of the enormous size of Houston's fish, some think the trout could have washed down from a private trout pond located upstream near Ray Creek. However, the fish was certified as a new record.

A lifelong angler, Houston said he had caught big trout before, including a 6½-pound rainbow. His record rainbow has been mounted and now reposes on his wall. "It's just beautiful," he beamed.

Record Rainbow: *Angler Hillard Houston displays his new state record 14-pound 8-ounce rainbow. Houston caught the fish on Ray Creek in Macon County on a piece of corn.*

Features Redheads, Cape Lookout Lighthouse

1991 North Carolina Duck Stamp and Print Available

Last year, North Carolina's migratory waterfowl stamp and art print depicting snow geese flying over the Cape Hatteras lighthouse proved extremely popular with collectors. This year, the 1990 North Carolina duck stamp will again depict a lighthouse, making this the second year in a series of seven that the N.C. Wildlife Resources Commission will feature the state's historic lighthouses in paintings for the annual waterfowl stamp print program.

A pair of redheads and the Cape Lookout lighthouse are featured on the 1990 stamp and art print. Wildlife artist Robert Leslie of Turnersville, N.J., painted this year's print after a boat trip across Core Sound to the Cape Lookout lighthouse.

Since July, the waterfowl stamp has been available from Commission hunting and fishing license agents. Art dealers are now taking orders for the 1990 print. The 1990 print will be available through Dec. 30, 1991. After that, remaining duck stamp prints will be destroyed. A new Wildlife Commission policy requires that all unsold art prints will be destroyed. If you missed last year's print, however, there is still time to order one. The 1989 print will be available until Dec. 30, 1990. This gives collectors a chance to begin the seven-year series of prints featuring lighthouses and waterfowl.

North Carolina's duck stamp program is eight years old. Since 1987, waterfowl hunters in North Carolina have been required to buy a state waterfowl license in addition to the federal waterfowl stamp. Prior to 1987, the purchase of stamps was voluntary.

Money generated from the sale of waterfowl licenses and print royalties goes into the Commission's special Waterfowl Fund. The fund has helped purchase thousands of acres of wetlands in the state including Conine Island in Bertie County, Hunting Creek Swamp in Davie County and the White Oak waterfowl impoundment in Onslow County. The money is also helping meet North Carolina's financial obligations in the implementation of the North American Waterfowl Management Plan. In addition, the revenue has helped fund a goose-banding project and the purchase of equipment used in managing wetlands.

Duck Stamp: *The 1990 North Carolina Duck Stamp and art prints are now available. This is the second year of a seven-year series featuring waterfowl and North Carolina's famous coastal lighthouses.*

"Buying a duck stamp or art print not only provides a beautiful addition to your home but also helps build a better future for waterfowl in North Carolina," said Sid Baynes, chief of the Wildlife Commission's Division of Conservation Education.

—Angela Dorman Hill

Angler Used Minnow

Record Yellow Perch Caught

Evelyn Etheridge pulled this 2-pound 9-ounce yellow perch from Indiantown Creek near Camden to set a new state record for the species. She caught the fish on a minnow on February 8, 1990 while fishing the annual yellow perch run with her husband, Tom. Her fish broke the old record by 6 ounces. She describes herself as a "dedicated" angler; and she and her husband fish together often. "When I got married, I learned Tom was addicted to fishing and I knew that I'd better learn to fish if I ever wanted to see him," she said. "But I love to fish now."

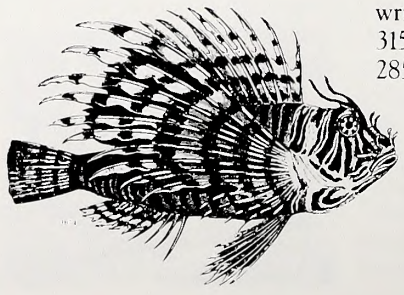
EVELYN ETHERIDGE

Calendar

On several occasions, events in this calendar have changed without notice. Readers should check the contact before travelling to an event. Listings for the calendar should be sent at least four months in advance.

August 16

The 14th annual Strange Seafood Festival will be held at the North Carolina Maritime Museum in Beaufort and will feature educational exhibits and 40 strange seafoods to taste. For tickets and more information, write N.C. Maritime Museum, 315 Front St., Beaufort, N.C. 28516 or call (919) 728-7317.



Anglers Get Lucky with Jumping Bass

Friday 13th Doesn't Keep Fish Out of Boat

A few years back, Bob Moosely and I were fishing at our favorite lake on Friday the 13th. The summer weather was hot and dry. The overflow outlet at the dam was leaking badly, and the lake water level was low. Fishing was slow.

Finally, Bob got a strike and landed a nice 6-pound large-mouth bass. It was a weird-looking critter — slim-bodied with protruding eyeballs that stuck out about ½ inch from their sockets. Bob tied it to a stringer at the back end of the boat.

Due to the dry weather and low water level, the lake's contour looked like an hourglass figure, deeper and round at the dam end, with a narrow channel in the middle above which it opened into the shallow end.

The bass certainly had "lock-jaw," so we moved into this channel hoping for better luck. The channel was not over 20 feet wide, and when we pulled into it to anchor, our johnboat almost blocked the channel. I picked up the anchor and was going to lower it very quietly to the bottom. Bob stood up and was about to make a cast, when, at the same time, the anchor slipped out of my hand and plunged loudly into the water. At that very instant, a huge bass exploded out of the water, literally attempting to jump over our boat. The big lunker hit Bob chest high and fell into the boat. I didn't realize what had happened, and the big bass was flopping fiercely. At first, I thought the pop-eyed bass on the stringer had jumped into the boat.

"Get hold of the stringer," I shouted to Bob. "There is no stringer," he responded.

After two or three slippery attempts Bob captured the bass. We sat there in amazement and laughed for five minutes trying to analyze this mysterious situation.

I finally got my scales out and weighed our lucky catch. It weighed exactly seven pounds. Bob reached to the stern of the boat and pulled up the 6-pound pop-eyed bass and laid it beside the 7-pounder.

"This sure is my lucky day," he exclaimed. "Friday the 13th and 13 pounds of lunker bass!"

— Bill King

Cast Us A Line...

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit any correspondence. Please sent to Letters Dept., *Wildlife In North Carolina*, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Over 400 Students Compete

Yadkin Schools Win Shooting Tournament

Yadkin County's Forbush Senior and Junior High School students shot their way to top honors this spring in the state's annual shooting competition in Salisbury.

More than 400 students came from 56 schools across North Carolina to compete in the N.C. Wildlife Resources Commission's 12th annual Hunter Education Tournament. Both Forbush teams qualified to compete in the National Hunter Education Invitational Championships held in Grenada, Mississippi this July.

The Forbush senior team scored 2,316 points out of a possible 2,400, while the junior Forbush team scored 2,209. Lee Byerly of West Davidson (County) High School scored the highest individually in the senior division with 584 points out of a possible 600 points. Marty Jones of Forbush scored the highest individually in the junior division with his score of 580 points.

The students competed in three categories — shotgun, rifle and archery. "For many of these kids, it's the highlight of their year," said Capt. Wilton Pate, chief hunter education officer for the Wildlife Resources Commission. "It gives them an opportunity to put into effect what they've learned in the hunter education course they've had in school. By demonstrating their skills, they can go beyond the minimum performance required in the classroom. As a result, we're turning out better sportsmen for the future."

Since 1982, the Commission has been training about 25,000 students per year in North Carolina's hunter safety program. Next year, the Commission's hunter education course becomes mandatory for first-time license buyers. Hunters who produce an old license will not be required to take the course.

— Angela Dorman Hill

The Wildlife Endowment Fund Report

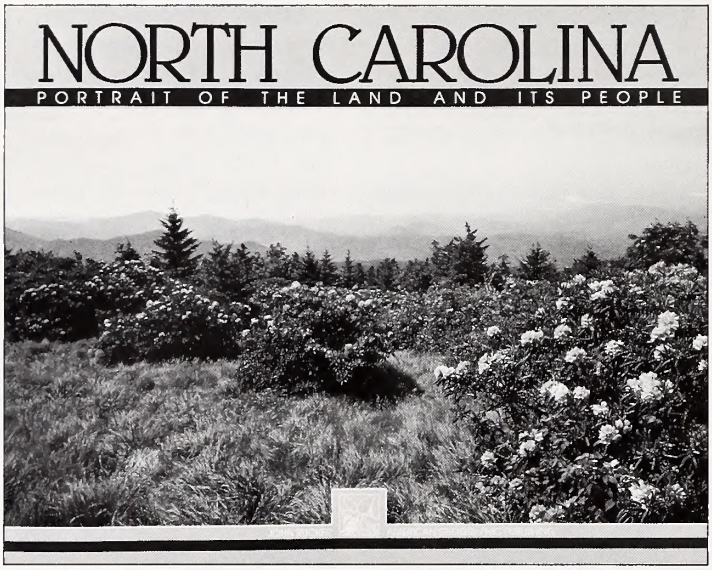
The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, NC 27604-1188.

Status on May 30, 1990

	Number Sold	Revenue Received
Lifetime Sportsman's Licenses	49,339	$18,510,510.48
Lifetime Hunting Licenses	643	182,128.53
Lifetime Fishing Licenses	3,871	901,200.70
Lifetime Subscriptions to *Wildlife in N.C.*	1,994	275,349.02
Contributions	—	177,575.68
Total	56,047	$20,163,764.41
Total Interest Earned		$5,734,948.91

Book Review

A Portrait of North Carolina



North Carolina: Portrait of the Land and Its People, by John Rucker, $15.95, 1989, 112 pages. Published by American Geographic Publishing, P.O. Box 5630, Helena, MT 59604.

With the publication of this book, author and North Carolina native John Rucker has returned to his roots. In his previous book, *Melancholy Bay*, Rucker took readers and his beloved dog, Barney, on a journey across the wildlands of North America. In hauntingly beautiful prose, Rucker painted his intimate, sometimes depressing, impressions of this continent's magnificent, yet disappearing, wilderness.

North Carolina: Portrait of the Land and Its People is an entirely different kind of work. Whereas *Melancholy Bay* was a personal journal, Rucker's new work is a broadbrush portrait of the natural beauty and history of the state, its people and industry, as well as the geography that helped shape its identity. Set in coffee-table format, *North Carolina* is amply illustrated by modern photographers like Chip Henderson, and also with unique historical photos that capture the flavor of the state's past.

What distinguishes this from run-of-the-mill picture books, however, is Rucker's considerable literary talent. Rucker's writing, while muted in contrast to the aching sadness found in *Melancholy Bay*, blends colorful historical anecdotes with modern descriptive observations and adds a dash of sociological interpretation as well. While the work covers the entire state, Rucker's prose really shines when he describes the mountains and its people, a region very dear to his heart.

Although this book says much about the wonderful people and "progress" of North Carolina, Rucker doesn't overlook the fact that the state is close to losing the natural resources that have made North Carolina such a popular place for growth. In the last words of the book, the author urges: "Let us have a little competition, not only in selling cigarettes, textiles and furniture. But once in a while let us exalt the importance of living simply and the importance of the land, for these things are North Carolina's strength."

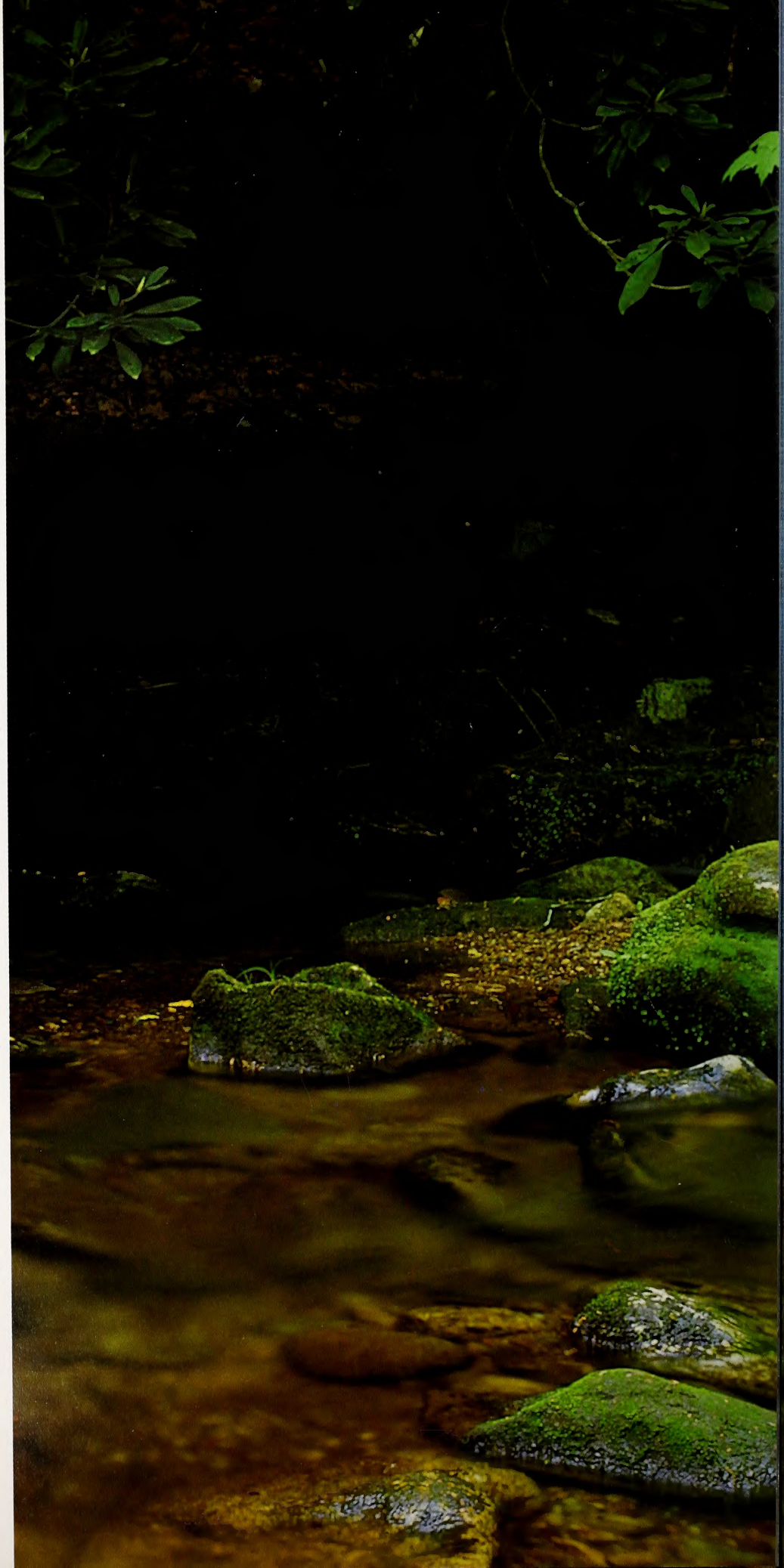
Amen. Don't miss this one.

— Vic Venters

Limited Edition Print of the 1990-91 Sportsman's Stamp License now available.

"Beagles and Rabbit"
Roger Cruwys

To order your 1990 North Carolina Sportsman's Stamp Print, contact your local picture framer or art dealer. Your purchase of a sportsman's print will support North Carolina's wildlife conservation programs.



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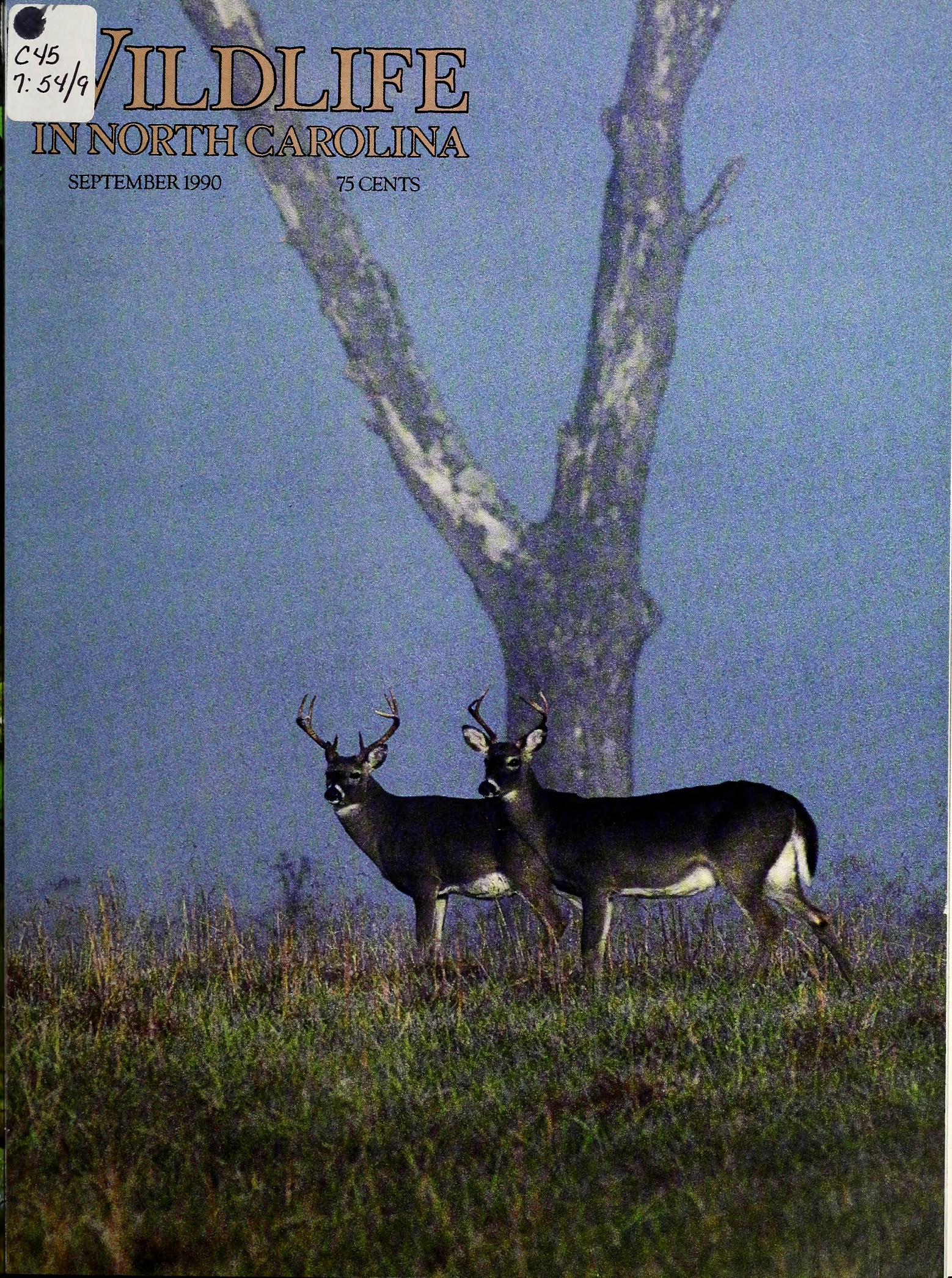
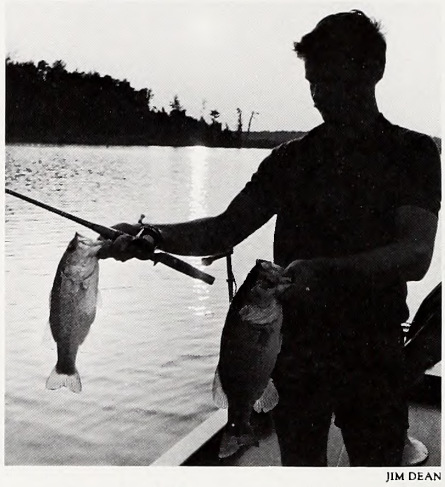


Big Lakes And Bewildering Bass

by Jim Dean

"Take a look at this," Mike Gaddis said as he swung the big crankbait across the boat so I could see it more closely. Stuck on one of the treble hooks were two or three fish scales—big scales from a sizeable largemouth bass.

"Either that bass struck at my plug and missed it, or the fish just happened to be in the way and nearly got snagged,"said Mike. "I could feel the lure bouncing off cover, but I never felt anything I could distinguish as a strike. Anyway, that bass sure left us a calling card."



JIM DEAN

It was nice to know that perhaps our depthfinder hadn't been lying earlier when it had shown fish hanging in the cover we had just fished so thoroughly and unsuccessfully. For years, Mike and I have half-kidded each other that manufacturers might simply program a bunch of fake fish on the screen just to keep anglers interested (Hey, who's to know?).

One thing is certain. Even if you can believe your depthfinder, fishing big lakes for bass requires more skill and patience than any other type of bass fishing, and especially from mid-summer through early fall when angling can be a boom or bust situation even for experienced fishermen. Mike doubles the difficulty because he specializes in fishing for lunker bass, and he pursues his quarry with admirable intensity and skill (see his article, "Blazing Bass" in the July 1990 issue). More often than not, he's successful even by his own high standards. This year, so far, he's already caught dozens of bass in the 4 to 6-pound class—he doesn't consider these true lunkers, by the way -and since spring, he has landed a number of larger bass up to 8 ½ pounds. He's always looking for that 10-pound plus bass, and he's caught his share in the past. But what about today? What would it take, we wondered, to entice a lunker to eat one of our offerings?

"Let's take another look at the cover,"said Mike. "I'm curious to see if our depthfinder still shows fish there after all the time we've spent fishing it." Slowly, we made several passes over the spot where a submerged point ran out from the shore to a depth of about 16-feet, then dropped sharply into 35 feet of water at a bend in the river channel. Where the cooler, oxygenated layer of water in the thermocline intersected the lip of that channel, a dense isolated mass of brush and stumps could be seen on the depthfinder. It was a classic mid-summer bass hangout, and scattered in the cover just below the lip of the channel, we could see the blips on the sonar indicating that sizeable fish, undoubtedly largemouth bass, were indeed still there.

It was especially puzzling because Mike had been catching bass regularly at the same spot in recent weeks. Yet, after nearly an hour of cranking plugs and worms through the cover, that wad of scales Mike had snagged were the best evidence we had that there was a bass anywhere within a hundred miles. In desperation, we'd even tried jigging vertically with pigs 'n jigs and heavy spoons. There is no way those fish could have missed seeing all those lures. So what was the problem?

Whatever it was, it persisted at every spot we tried that torrid day from early morning until dusk when we finally caught four bass in rapid succession from a spot almost exactly like the others we'd been fishing. Why had the fishing suddenly become so easy?

One of the oldest tenants of bass fishing is that if you can locate the fish, you can catch them if you're a reasonably skillful angler. That's bound to be true at times. Yet, while finding bass is always the first step, it's obviously by no means foolproof.

Every fisherman experiences days when it just doesn't seem to make much difference where or how you fish, and Mike and I are convinced it's because there are plenty of times when bass and other species of fish simply don't feed. When that's true, it seems to affect all fish of the same species at the same time. Some say it's the moon phase or barometric pressure; others say it's the water temperature or time of day. There are dozens of possible reasons, and it may be a combination, but the fact is that even the best fishermen really don't know the answer. As much as we hate to admit it, it probably wasn't skill that helped us catch those four bass at the end of the day. Most likely, they just got hungry.

Of course, reducing success to such an elemental theory doesn't discourage fishermen from trying to provoke an unscheduled hunger pang.

"You know,"said Mike, as we headed for the landing that evening. "I have a notion that we could have caught those bass if we'd had some live soft-shelled crawfish to show them."

I think he's right. Many times I've been too full to eat another potato chip, but I could always find room for a bowl of ice cream. I'll bet bass are no different.

September, 1990
Volume 54, Number 9

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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DEPARTMENTS

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Back Of The Book *by Vic Venters*

Cover *Whitetailed deer are notoriously wary, but these bucks have lingered in a misty meadow in early morning, perhaps because they are competing among themselves for does. Photograph by William S. Lea.*

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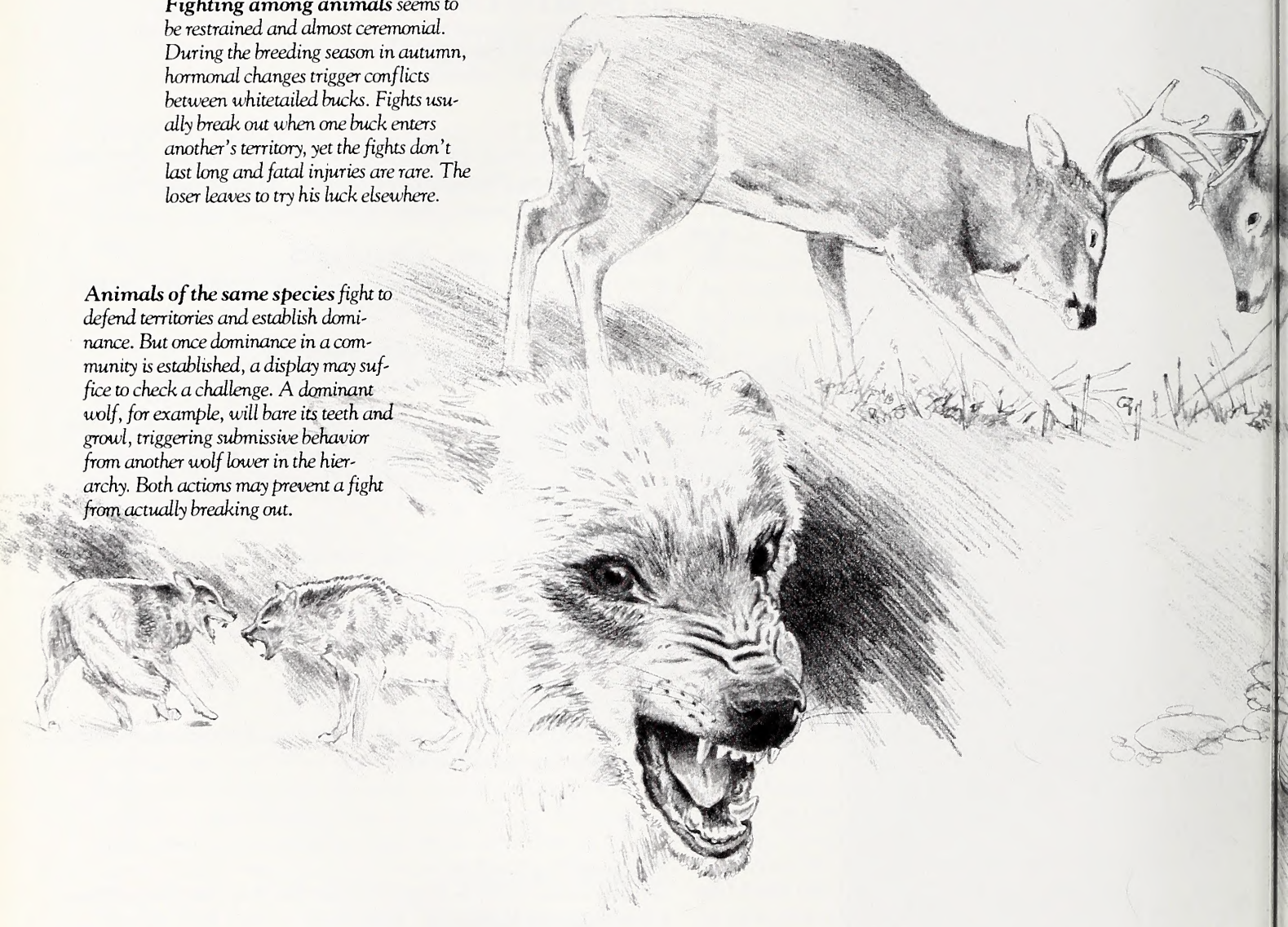
Fighting among animals *seems to be restrained and almost ceremonial. During the breeding season in autumn, hormonal changes trigger conflicts between whitetailed bucks. Fights usually break out when one buck enters another's territory, yet the fights don't last long and fatal injuries are rare. The loser leaves to try his luck elsewhere.*

Animals of the same species *fight to defend territories and establish dominance. But once dominance in a community is established, a display may suffice to check a challenge. A dominant wolf, for example, will bare its teeth and growl, triggering submissive behavior from another wolf lower in the hierarchy. Both actions may prevent a fight from actually breaking out.*



Battling Beasts

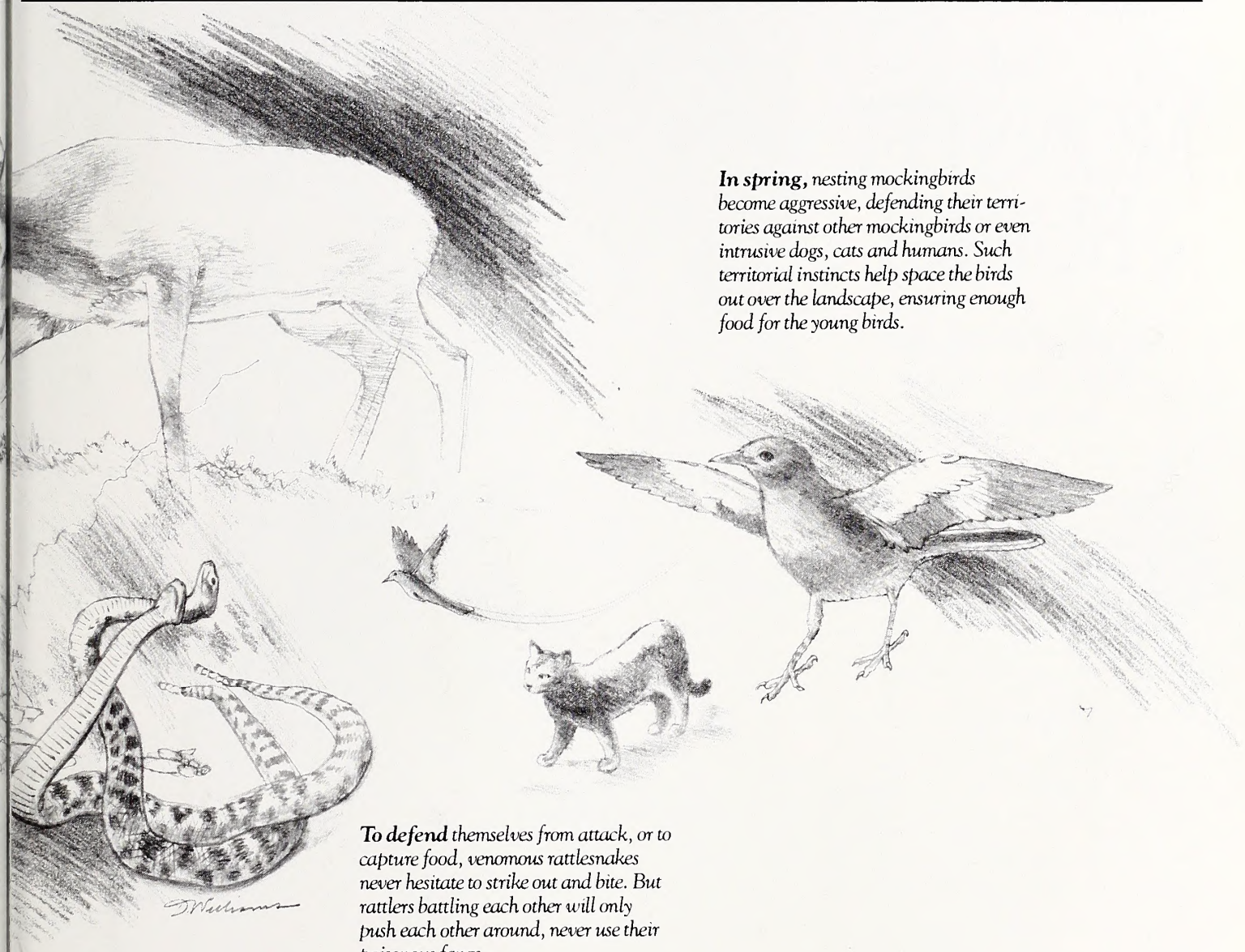
written by Lawrence S. Earley/illustrated by David Williams

Fights are normal among mammals, birds, fish and even reptiles, yet unlike the clashes between humans, few animal disputes are ever fatal and most are bloodless.

Indeed, most animal aggression doesn't even get to the fighting stage. Dogs growl, cats arch their backs, birds fluff up their feathers to look huge, monkeys stare: these displays often serve to drive away potential challengers. And when animals do fight, what's remarkable is how little damage is done. Though equipped with teeth and claws that can rip the flesh of prey, or strong coils and poison that can kill within minutes, most predators seem to leave their weaponry sheathed when in a dispute with another of their own kind. Some biologists, looking at the restrained way that animals fight, have said that it's more like a ritual or ceremony than an actual battle.

Two rattlesnakes, for example, will rise up off the ground and push each other around, but they never use their poisonous glands to win a victory. Two fish will lock jaws but rarely bite. Two deer will shove each other around but hardly ever gore each other. Even a prey species like a bull moose will engage in a shoving match with another moose, not strike out with its forefeet as when defending itself against a wolf.

Aggression is often seen in contests over dominance, when two animals of the same species duel to determine who's on top. Most of the year, buck deer, for example, travel in male groups that are arranged in a sort of rigid chain of command. Chickens and other flocking birds establish pecking orders. Dominance isn't a haphazard arrangement but absolutely necessary to bring order to a



In spring, *nesting mockingbirds become aggressive, defending their territories against other mockingbirds or even intrusive dogs, cats and humans. Such territorial instincts help space the birds out over the landscape, ensuring enough food for the young birds.*

To defend *themselves from attack, or to capture food, venomous rattlesnakes never hesitate to strike out and bite. But rattlers battling each other will only push each other around, never use their poisonous fangs.*

social group and reduce unnecessary fighting.

The reproductive season also brings out aggression in many animals. In the fall, shoving matches erupt between whitetail bucks from different groups to establish who will mate with the does in a particular area. Such duels occur between equal-size whitetailed deer because a smaller buck will rarely challenge a bigger one. Generally the fight ends in less than five minutes with the "loser" scampering away. The winner gets to pass his genes on to his offspring, but the loser wins as well. Animal behaviorist Niko Tinbergen points out that rather than wasting time and energy in bloody battles, the losing buck can move on to unoccupied territory and mate there. "Success goes to the animal that knows when to flee as well as when to attack," says Tinbergen.

Fighting is also observed among territorial animals before they mate. In the spring, male songbirds will set up territories that they will defend against other birds. The mockingbird is a well-known example of this instinct. During the nesting season, it proclaims its territory on high singing perches and aggressively attacks intruding mockingbirds, as well as hapless dogs, cats and even humans that pass by. Intruders almost always lack the confidence to win such contests, and so the owner is generally victorious. Once the young birds are fledged and on their own, territories evaporate and the birds fall silent and coexist more peaceably.

The function of such brief aggressiveness is to space birds out over the landscape and make the most efficient use of existing resources, ensuring that the young get enough food to survive their early, needy months.

There are many similarities between human violence and aggression among animals. The apparent difference is that so often human violence is disfunctional, leading to strife and disorder. Aggression among other animal species seems to be functional, contributing to an orderly society and thus to the survival of each species.

Good Timing for MONSTER BUCKS

If you want big deer, put some passion in your hunts.

written by Mike Gaddis ©1990
photographed by William S. Lea

Alvin Conner, a man of extraordinary outdoor savvy and my mentor of many years standing, makes his case on trophy deer this way. "We humans think we're pretty sharp when it comes to taking game. Truth is, if it wasn't for the spawn, the rut and the strut, very few big bass, deer or turkeys would be taken. One way or the other, at one time or the other, we all get done in by passion."

Indeed, more trophy bucks are taken in and around the primary rut than any other time.

For North Carolina whitetails, the primary rut runs from about the second week of November into early December, give or take a week east and west. The primary rut should be the center of attention. It is during this period that does first become receptive, competition is greatest among the bucks, there are more bucks available to be hunted and passion is generally at a fever pitch.

During the two months preceding the breeding season, distinct patterns of behavior begin to emerge that signify the approaching onset of the rut. The bucolic

Like most humans, whitetail bucks think about the opposite sex a long time before they get around to any introductions, and during the fall, their minds are on little else. It's during the rut that a wary old buck is most likely to make a fatal mistake.

existence of the herd during the summer is disturbed by rising reproductive hormones and a process of segregation sets in. While the does continue to concentrate on normal feeding and resting activities, young bucks begin to splinter off into bachelor groups. There they spend more and more time polishing and comparing antlers, sparring and thinking about does. Sound familiar? The older, more mature bucks become more protective of the does and worry about keeping the youngsters in check. The young bucks are like budding teenagers. They have the urge and the wherewithal, but lack permission. As they become increasingly frustrated, they begin wandering around like street gangs, rubbing up the woods and leaving prolific trails of wounded saplings.

At this stage, which usually coincides with the latter half of the bow season, it is not uncommon to have several bucks come in at once. Bennie Moffit told me of an episode in the Birkhead Mountains involving four young bucks. "I was in a tree stand in a pine thicket. It was the third week in October. That's when we usually expect the bucks there. I hadn't been in the tree more than 15 minutes when the side of the mountain erupted and four bucks—two spikes, a 4 point and a small 8 point—ran helter-skelter in on top of me.

"They crossed my track but showed absolutely no sign of scenting me. Then, all hell broke loose! The spikes started chasing each other around my tree, and the two larger deer squared off about 40 yards away and began fighting. I was trying to decide which one to shoot when the largest spike stopped broadside some 30 yards out. I hate to admit it, but maybe they had me a bit unnerved. It happened so fast. Anyhow, I shot low and missed. The spikes ran off about 50 yards, snorting, which caused the 8 pointer to break off and run right toward the stand. This time my arrow ricocheted off his antlers. That did it. They left as quickly as they came, and I was fit to be tied!"

It can happen like that, and often, everybody ends up frustrated. It's catching.

***As the fall** rutting season approaches, contented family life in the herd is disrupted. The does normally go about their daily routine feeding and resting under the increasingly watchful eye of mature bucks, while the young bucks often form bachelor groups.*

***Mature whitetail bucks** spend a lot of time keeping other bucks away from their does, and as the rutting season progresses, that becomes a full-time job. Not only are other large bucks looking for any opportunity, so are countless young bucks. Most of the actual reproductive activity takes place at night.*

While the yearlings are out creating general havoc, the older bucks stay in the proximity of the does and attempt to stake out breeding territories. You begin to see deep gouges in 4-inch cedars and large, fresh scrapes around field edges. Sawmill roads and woods paths are overhung with twisted and wrung-off limbs. Serious fighting erupts when the real mossbacks that have been largely solitary to this point decide it's time to assert their dominance. As the rut approaches and the first does go into a heat cycle, this activity among the giants intensifies toward one purpose. The strongest bucks pursue the does to submission, with almost total abandon. Much of this activity occurs at night, but the reproductive desires of the bucks are so strong that some activity will spill over into shooting hours. It is then that the big trophy bucks are most prone to make mistakes and present hunters with the opportunity. This opportunity, when it comes, will develop swiftly and be short lived. You must be prepared.

I believe six basic points are essential to successful preparation for that moment:

- **Hunt bucks by taking advantage of their hunt for does.** Don't forget who's chasing whom, and that there are two hunts progressing simultaneously—yours for the buck and his for the does. It's the does that control the timing of the rut.
- **Spend scouting time patterning the does in your hunting area.** While the behavior of the bucks changes dramatically as the rut approaches, the collective travel, resting and feeding patterns of the does remain largely constant. With so much buck sign in the woods, it's easy to get carried away with the scrapes and rubs. Hunting scrapes does pay off sometimes, but less where there's more hunting pressure. Again, who's the center of attention? The bucks will be near the does. If you are, too, your chances for a shot are much improved. If the area you

***Whitetail bucks** polish their antlers on saplings and other small trees, removing the last vestiges of summer's velvet. Such activity also marks territories and strengthens neck muscles for the sparring that accompanies the rutting season.*

hunt is fairly large, there are likely several groups of does using it, and you will need to study the route of each.

- **Don't overscout.** Disturb the normal behavior of the herd as little as possible. Overscouting is a common mistake. Young bucks will tolerate a fair amount, but the trophy deer you're after won't. Mature bucks are extremely sensitive to human presence. If they are alerted by frequent trespass, they are unlikely to make the mistake you are hoping for.
- **Locate stands on doe trails, but near their intersection with buck cover.** Once you have the does patterned, analyze their route in respect to the topography and surrounding cover of your hunting area. Trophy bucks like thick cover, and if the land is hilly they like a downhill vantage with more than one escape avenue and a line of cover to mask their entry and exit. Look for thickets, blowdowns, prolific honeysuckle, undulations in the landscape that provide a natural hiding place, large rock formations, brier thickets around old sawmills and similar cover that is adjacent to your doe patterns. These are the places where the boys with the really big racks are likely to be lured into a daylight tryst with the does.

Well before you expect the rut to begin, use a cover scent or a scent neutralizer to slip in and place your stands close to these waylay points. Before you do, think long and hard about how and where that buck is likely to come out. Then put the stand in an unobtrusive but strategic relationship. I muffed an opportunity on a truly magnificent buck last year because I misfigured his rendezvous point by a scant 30 yards, and that was during the regular gunning season. The buck was chasing does all over the hill, lowing like a bull, and all I could do was catch a meager glimpse now and then. The cover was that heavy.

- **Don't overhunt the same stand location.** Try to locate at least four or five stand locations you really have faith in. Then rotate your hunts between them to minimize the evidence of your presence.
- **Watch closely for signs that the rut is near.** Hunt as often and hard as you can as the rut develops. When you see does, observe their behavior closely. If a doe comes along, pausing occasionally, appearing nervous, and looking back over her shoulder, that is your signal that a good buck may be following her. If a group of three or four does comes along at a crisp pace, it's the same thing so be ready. Does normally tip along, unless disturbed or chased. Maintain your vigil for some time after the does have passed. Bucks often follow at a distance, and the elapsed time may be as much as 30 minutes to an hour.

***In areas with good deer** populations, many small trees and bushes will bear these unmistakable marks. Deer hunters learn to look for these rubs to help them place their stands. A true trophy buck can do an amazing amount of damage to a small tree.*

Bow season offers an excellent opportunity for pre-rut scouting, and a chance to collect a young buck for the larder. With the pantry full, you can concentrate on bigger and better things. Also, there is always the chance early in the season that a big buck will walk out to

feed with the does close to dark.

Even if you decide not to pick up a bow this year, definitely entertain the idea of a muzzleloader. The muzzleloading season, as a rule, falls squarely within the early stages of the rut and is an excellent time to take a monster buck. At that time, hunting pressure has been relatively minimal, the chances that a big buck has been spooked are less and the desire of the bucks is at a crescendo. Likewise, concentrate hard on the first two weeks of regular gun season. This will be particularly true if you prefer your hunts one-on-one as I do, and live in a county that permits hunting with dogs. Once an area is hounded constantly with dogs, you can pretty well hang it up. Big deer move out entirely, or truly "go in the ground."

After the primary rut has run its course and hunting pressure has been steady for several weeks, it is very difficult for a hunter to match one on one successfully with big deer. The key is hunting *dense* cover, but getting in and out without spooking everything within a half-mile is extremely difficult. With ice on the ground, it's virtually impossible.

Trophy bucks rarely make mistakes. When they do, it's most often in the heat of the moment with a doe. If you've worked hard and your timing is good, you may be lucky enough to turn that into a fatal attraction! ⊠

***Although such sights** are not common, young bucks spend a great deal of time sparring with one another in preparation for the time when they may be mature enough to challenge another buck for a doe. Actual injury is very rare while sparring, but more likely later when the stakes are higher.*

Sweetheart Stream

In 1907, John Charles McNeill called the Lumbee (or Lumber) River "a tortuous, delicious flirt," a description that still fits.

by Bland Simpson

MELISSA McGAW

***Scott and Gayle Bigelow** and their children Jonathan and Katie wave as they paddle past Stevens Park in Lumberton (right). At historic Riverton Park (above), near the Wagram community, children frolic in summertime play. Though Riverton has declined since its 1970s heyday, it's still a Mecca for young people.*

Down on the Lumbee River
Where the eddies ripple cool
Your boat, I know, glides stealthily
About some shady pool.

—Poet John Charles McNeill
(1874-1907)
of Riverton, NC

On the afternoon of the third day canoeing down the upper Lumber River, young Leonard Freeman shot his 16-foot craft past a fallen tree, grazing the bank and rousing a wild nursing sow, a 300-pounder, that had her brood of a dozen nestled on a spit of land between the dark river and its swamp. Williams Haynes, Freeman's companion, slid a paddle underneath one of the piglets like a spatula, flipped it to Freeman and into the canoe, and off they went, out of the Sandhill pine country and downstream to Lumberton, where they procured a nursing bottle for their new ward, down into the cypress jungles of the lower Lumber—fed by Big, Flowers and Porter swamps—past Fair Bluff and into a wild country out of our realm, down the Pee Dees Little and Great, to Georgetown and the Atlantic. The two men, along with a setter named Belle, a Scottish terrier named Dixie, and their stolen piglet, T. Porker, Esquire, claimed to have made the first canoe trip from the Lumber's headwaters to the sea.

That was 75 years ago, and, whether or not their claim was true, Haynes's and Freeman's zest for the river *was*. In more recent years, the Lumber, particularly the upper river with its blackwater lowland look and its hill country rapidity, has charmed thousands of paddlers.

"She is a tortuous, delicious flirt," wrote Riverton poet John Charles McNeill in 1907, "but she does not deserve the punishment put upon her by geographers, who have perverted her sweet Indian name of Lumbee into something that suggests choking sawdust, rotting slabs, and the shrill scream of the circular saw."

COLIN OSBORNE III

When my wife, Ann, and I ventured out early last May in our 17-foot white Mohawk, the Lumber was running high and heavy.

We first took a late-morning look at the 15-501 bridge over Drowning Creek. There were turkey feathers along the roadside and dandelions two feet tall, and the air was redolent of smoke from a control burn in the piney woods north of the creek. Some hold that the Lumber is born at the confluence of Drowning and Naked Creeks above here, others say at Drowning and Buffalo Creeks below; but, either way, in its upper reaches this is its aspect: a thin, dark stream, one of short stretches and sharp, slaloming turns ("Cow faces," Haynes said was the native name for these bends) varying from 20 to 40 feet in width and almost always canopied by cypress, gum, maple and occasional pine.

A bay tree at the 501 bridge was all abloom with white flowers from the bottom to the top. A pileated woodpecker cried out, and we watched swallows curve and cruise about the bridge, then saw two wood ducks slide back and forth across the river by a downed tree upstream, one even having enough temerity to step out of the water and onto the tree for a few moments. The path on the south side here, though well-worn, was a mite steep for a put-in, and the river a bit cinched up, so we rambled farther downstream and slipped in at the ramp beside the old 401 bridge.

"There must have been a *big* hatch this weekend," Ann said, bemused by the

Sweetheart Stream

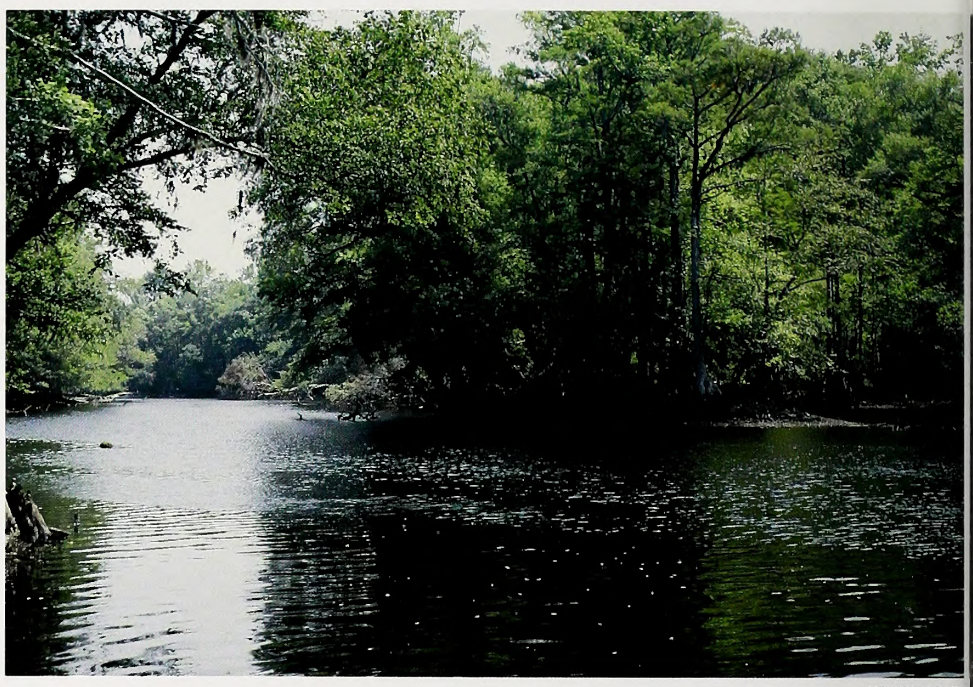
bottlegreen damselflies that were aswarm on overhangs, lily pads, everywhere. We paddled around in a cypress grove above the bridge, then on upstream a ways, a task not difficult but steady against the swift springtime flow of the rich black stream. When we reached a blow-down barricade, we turned around and rode the river back down.

Under the bridge were the wild sculptures of cliff dwellers, tubular villages of the mud dauber wasp, and the neat half-cone nests of swallows, which were upset and all aflutter over our short intrusions. Ann and I glided the canoe behind the root ball of a recent cave-in, through a chute so narrow we might have lodged, but we were so inspired by thoughts of 300-pound sows and no-shouldered wildlife that our negotiation of the scant channel was brief.

This was woodpecker heaven. Pileateds kept sounding off, and trees they have pocked, scarred and dug out were plentiful. We watched a hairy woodpecker on a slender bankside tree work his way from the ground up nearly to the crown, while the hollow tattooing of another woodpecker carried clearly through the river bottom. I got glimpses of large birds out in the forest, flying dark, steady and unobtruded through the jungle. The songbirds, too, were here, back from the tropics, prothonotary warblers busily shuttling about. A kingfisher scooted downriver in urgent flight, with his percussive, coming-through cry, but the loudest music came from none of these—it was the swirling song of waters steadily eddying, rippling and whirling around the fallen trees that lay in every reach.

On our way back up to the 401 bridge we stopped to admire a pair of dramatic downfalls—two pines, each of them 3 feet thick, one lying prone, its rusty crown in the shallows of the stream, just high enough above the Lumber for us to slip beneath, the other a little upstream, lodged at a 40-degree angle, awaiting its fate.

"The down and the doomed," Ann spoke drolly of them, and a short while later my sweetheart and I sat on boat cushions beside the stream, laughing and filling up on sardines.



MELISSA McGAW

MELISSA McGAW

Picturesque vistas *greet boaters and canoers on the Lumber River. Near Fair Bluff, in Columbus County, river runners will find a few landings with trails that lead to Big Sandy Ridge, a high sand ridge with unique plant communities. This cluster of pitcher plants (left) was found not far from the river.*

Earl, Julie, Sonny, Mary, D. Rex. These were just a few of the names carved into the last planks of the long boardwalk winding through the cypress at Riverton Park, a private preserve on the Lumber just below Wagram. The park's setting is lovely, a high, curving bluff with beautiful tall pines, falling away gently to a small beach with tadpoles and minnows in the sandy shallows. We had driven through the goldenrod and toadflax along the hard road, guessed right and turned off onto an unmarked dirt road with puddle holes that could swallow a Chevrolet (and I mean a big Malibu, not a Geo), and now I was standing at the boardwalk's end, thinking about the state of the Lumber River.

The gorgeous and enchanting upper Lumber, from the 15-501 bridge down to the NC 71 bridge, is the Lumber River Canoe Trail, the first such in North Carolina. A couple of decades ago, John Memory and his twin brother ran a canoe race from the 15-501 bridge to Riverton, which is slightly over halfway down the trail, and Memory recalled to me, "I don't ever remember getting out of the canoe, it was pretty well cleared—you couldn't do that today." The only clear stretch of any length on the upper Lumber right now, he said, is a three-hour float from Riverton down to a keyhole lagoon off the south side of the river, near the J. P. Stevens plant just above McGirt's Bridge.

Hurricane Hugo last fall, along with the December 24th blizzard that was all ice in the Scotland and Robeson area, have combined to clog the river with a hundred-year record of downfalls, and the nascent Upper Lumber River Association—to which river guide Memory belongs—is looking for a hand in clearing the stream wherever it might find it—Hugo relief funds, recreation department funds, even army help, if the government will allow. "If we have to, we'll do it ourselves," Memory said, adding, "I, per-

MELISSA McGAW

***A river's a place** to dream by, as these two river folk find. The Lumber has long been a center of attention for the white, black and Lumbee Indian communities that live along its tortuous North Carolina length. Rich in robin, largemouth bass, catfish and perch, the river draws hosts of fishermen who fish from bank and boat.*

sonally, with a bow saw, can do quite a bit of damage to a tree."

"I just heard that, because of all the blow downs, the canoe trail had been removed from the national canoe registry," said Colin Osborne, of the Lumber River Basin Committee, in June. Osborne, a Lumberton dentist who as a Sea Scout once canoed all the way from the Lumbee Indian community of Redbanks down to Georgetown, said that the river had been snagged through Robeson County some years ago, but not lately. His group, too, is hoping the army will send the infantry its way.

'Twas ever thus. The General Assembly in 1809 created a concern called the Lumber River Navigation Company to "run" the river, to clear it and keep it clear as a public waterway, and the legislature also authorized the outfit to raise money for clearing snags by lottery, a funding method then—and perhaps still—more popular than taxes. Proposals in 1798 and again in 1815 to connect the Lumber and Cape Fear rivers by canal—and send piney woods products out through a Carolina port—both failed, and the turpentine-and-timber town of Lumberton in the late 1800s was still sending 100-foot log rafts downriver to Georgetown, where their three-man crews collected a couple hundred dollars for the lumber and the two weeks' poling and then walked on home.

"The town then being a liquor town," wrote Woodberry Lennon of 1890s Lumberton, "almost every other business was a bar-room." On the west side of the Lumber River just outside of town was Mud Market, a camping ground for wagons carrying produce, tobacco and whiskey.

"Murders, suicides and bold robberies were common upon (Lumberton's) streets, and the waters of Lumber River were the grave of numbers of murdered and drowned."

Earlier residents aways upstream were apparently no less raucous. A 1754 Bladen County militia report described "Drowning Creek on the head of the Little Pee Dee—50 families, a mixt crew, a lawless people, possess the lands without patent or paying quit rents, shot a surveyor for coming to view vacant lands being enclosed in great swamps."

Nowadays in these swamps—Robeson

Sweetheart Stream

COLIN OSBORNE III

***Groups such as the** Lumber River Basin Committee have fought to protect the river from environmental threats. Events such as this 1984 cleanup at Stevens Park (right), sponsored by the committee, drew scores of area residents. For nearly 10 years, the Lumber River Canoe Club has promoted appreciation of the river by running frequent trips (below).*

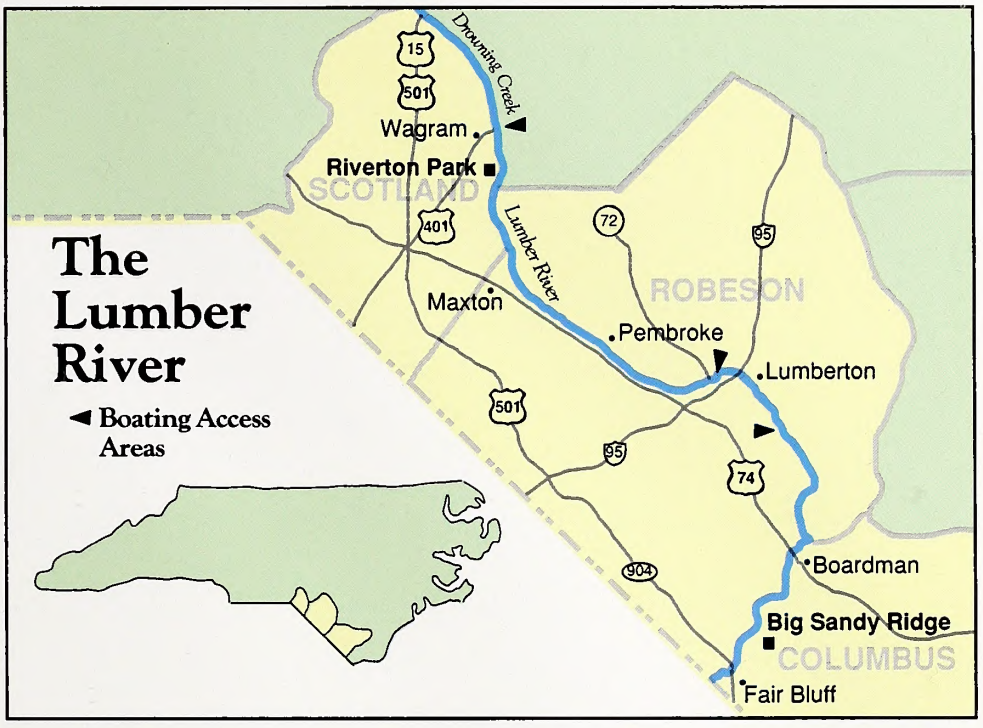
COLIN OSBORNE III

County alone has over 50, most of which drain into Lumber River—the state has named a canoe trail and designated the river above Interstate 95 as *scenic*, through Lumberton as *recreational*, and downstream of there as *natural*. One hundred and two miles of the river, from SR 1412 in Scotland County on down through Robeson County to the state line, have won inclusion in the state's Natural and Scenic Rivers System. And the state has voted that there be a Lumber River State Park, though this park owns no land and has no land acquisition funds. There are two park rangers approved for it, though their pay must come from a raid on maintenance funds elsewhere.

What the state has really done for the Lumber, or started to do in a nominal way, is recognize the tremendous outpouring of popular support for this blackwater river, the protective impulse that during the 1980s inspired groups like the Lumber River Basin Committee and Sensible Concerns about Toxics (SCAT) to fight the location of a major hazardous-waste treatment plant—GSX, now Laidlaw—at the Laurinburg-Maxton Airbase. Unchallenged, this plant might have poured a half million gallons a day of treated effluent via the public works into Lumber River, and it might still, within the 1:1,000 dilution limits of the state's 1987 "Drinking Water Law," dump nearly 80,000 gallons of wastewater daily into the river.

Many in its valley have shown great love and care for this river and have made earnest and valid protectionist efforts in its behalf, people like Memory and Osborne, Sherwood Hinson, David and Donna Scott, Ann Slaughter, Danny and Diane Isom, Al Pittman, Richard Regan, Bob Gaddy and Bill Scott. What will come of their work, though, if Southern Pines draws too heavily on Drowning Creek—as it may—for its water, threatening the river with ecological damage and change by causing frequent or extended drought levels? And what will come of the park if it is a park in name only, leaving private citizens to continue struggling with their bow and chain saws, with their own time and pocketbooks, to keep the river that poet McNeill called "a sweetheart stream" running free and clear, and clean?

Though it was still basically sound, there were a few planks missing in the Riverton Park boardwalk, and a 10-inch tree lay fallen across it last May. Trash was overflowing the garbage cans, and facilities there were in bad shape,



unkempt and covered with graffiti, the little beach at the bend in the river showing wear from the heavy pressure of the whites, blacks and Indians who flock to it in equal numbers. Riverton Park is privately owned, though, and, according to Memory, its owner might well make the Nature Conservancy, or the state, a good deal on it.

That could be a start to it all, I thought as Ann and I drove away, carefully sneaking by the borrow pits in the road. That could be a very good start.

Ann was catching minnows in her hand in the shallows by the NC 71 bridge, and I was staring at a 20-foot section of cypress blown down out of the top of a tree beside the road. It was late in the day then, and we paddled our Mohawk upstream, where there were more prothonotary warblers, and a red-bellied woodpecker this time.

Everywhere water was in the woods. We cut a hundred yards or more off the river by slipping through one drowned grove, but when we came back down, the Lumber River took its turn with us—the current was so swift and forceful we kept getting pinned against one tree or another and had a hard time getting the boat aimed to where we could reasonably steer, no matter how much ferrying, prying and drawing of the canoe we did.

Our time on the Lumber was a lark, and I thought of a couple of serendipitous stories I'd heard about the river, of law students from Carolina coming down and launching in, un- or ill-advised as to where and when to do so, and sallying forth in a torrent in the dark, one of them with enough sense and savvy to find them a pine stump for a midnight fatwood fire in the rain. Of a Wilmington artist who, out once in a canoe with her young son, talked herself blue saying no, there was no, there was no way, they were miles from anywhere, to his constant requests for a soda, only to hear a johnboat puttering upstream and, when it came round the bend towards them, have it be a friend of theirs, whose first remark was, "Hey, y'all, want a Pepsi?"

Lumber River is full of robin redbreast, perch, largemouth bass, catfish, eel, all kinds of panfish, though we didn't wet a line. The river and its wet woods are home to mink and otter and beaver and more, and though we didn't see them that May day, Ann and I *did* see the sweetheart stream that poet McNeill sang of, a small river that husbands and wives, whole families and cohorts, fish together at day's end, where small boats ride in the backs of pickup trucks, and it is never very hard to get on the water.

And if the Lumber wants a little more attention from us just now, the river deserves it, if delight deserves any reward. We may never break or even challenge Haynes's and Freeman's 10-day record from the Sandhills to the sea, but I know of one white canoe that will be back on Lumber River, and I know the pair who will be in it, delighted to be staring down those cow faces once again and gliding just as stealthily as you please. ⊠

North Carolina Hunting Seasons 1990-91

Species	Hunting Season	Daily Limit	Possession	Season
Crow	Thurs., Fri., Sat. of each week from July 1 to Feb. 28 and Thurs., Fri., Sat. and each week from June 1 to June 30 plus Labor Day and Christmas Day	No restriction		
Dove	Sept. 1-Oct. 6 (all day) Nov. 20-Nov. 24 (all day) Dec. 15-Jan. 12 (all day) Shooting hours are from one-half hour before sunrise until sunset.	12	24	None
Rails, Moorhens and Gallinules				
Moorhens and Gallinules	Sept. 1-Nov. 9	15	30	None
Clapper Rail, King Rail	Sept. 1-Nov. 9	15	30	None
Sora Rail, Virginia Rail	Sept. 1-Nov. 9	25	25	None
Deer		2	4	***4
Bow and Arrow	Sept. 10-Oct. 6 (*Eastern) Sept. 10-Oct. 6 and Oct. 15-Nov. 17 (*Western, except Yancey County) Sept. 10-Nov. 3 (*Central) Sept. 10-Nov. 10 (Northwestern)			
Muzzleloading	Oct. 8-Oct. 13 (*Eastern) Oct. 8-Oct. 13 (Western) Nov. 5-Nov. 10 (*Central) Nov. 12-Nov. 17 (Northwestern)			
Gun	Oct. 15-Jan. 1 (*Eastern) Nov. 12-Jan. 1 (*Central) Nov. 19-Dec. 1 (*Northwestern) Nov. 19-Dec. 8 (*Western)			
Gun Either Sex and Special Either Sex	See 1990-91 *North Carolina Inland Fishing, Hunting and Trapping Regulations Digest*			
Wild Boar	Oct. 15-Nov. 17 and			

Wild Boar	Oct. 15-Nov. 17 and Dec. 10-Jan. 1	1	1	2
Gray Squirrel	Oct. 15-Jan. 31	****8	16	75
Fox Squirrel	Oct. 15-Dec. 31 (Only in 18 counties. Season closed elsewhere. See *Regulations Digest*)	****1	2	10
Common Snipe	Nov. 14-Feb. 28	8	16	None
Quail	Nov. 17-Feb. 28	10	20	None
Ruffed Grouse	Oct. 15-Feb. 28	3	6	30
Raccoon and Opossum	**Oct. 15 (sunrise)-Jan. 31 **Oct. 22 (sunrise)-Feb. 28	No restriction on opossum. See *Regulations Digest* for bag limits on raccoon.		
Rabbit Rabbit—Box Trapping	Nov. 17-Feb. 28 Nov. 17-Feb. 28	5	10	75
Pheasant—Nonnative Male Pheasant Only	Nov. 17-Feb. 1	3	6	30
Woodcock	Dec. 6-Jan. 19	3	6	None
Bobcat	**Dec. 10-Jan. 31 **Dec. 10-Feb. 9	No restriction		
Fox	See *Regulations Digest*			
Groundhog	No closed season or bag limits.			
Wild Turkey Bearded Turkey Only	**April 13-May 11	1	2	2
Resident Canada Geese	Sept. 4-Sept. 10 (west of I-95 only, permit required)	2	4	None
Migratory Waterfowl	Unavailable at this time; Federal regulations may be obtained by contacting license agent or writing N.C. Wildlife Resources Commission after October 1, 1990.			

* See *1990-91 North Carolina Inland Fishing, Hunting & Trapping Regulations Digest* for approximate boundaries of Eastern, Central, Northwestern and Western deer seasons. For a copy of the *Digest*, write: N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, N.C. 27604-1188.

** Season varies from location to location; see *1990-91 Regulations Digest.*

*** *An additional antlerless deer may be taken during established either-sex seasons in Eastern and Central areas.*

**** *Total limit of 8 squirrels per day of which one can be a fox squirrel.*

Red Drum Today

Most of the truly big red drum are caught from boats and Hatteras Island piers by a handful of experienced anglers, and biologists have discovered that some whopper drum may be over 50 years old.

written and photographed by Joel Arrington ©1990

***A pair of strong arms** and custom-built rods (right) help anglers make the long casts necessary to catch red drum from piers or the surf. These powerful rods—known as "Hatteras Heavers"—handle heavy tackle nicely, as well as the surging runs of the drum. Played down, this red drum (below) glides to the boat. Also known as redfish or channel bass, red drum on the North Carolina coast reach sizes larger than those found in more southern locales.*

Vic Gaspeny, one among several anglers gathered at the end of Avon Pier, looked out across a brown, whitecapped sea and watched a whale launch itself like a Trident missile through shoals of menhaden. A rare sight off the Outer Banks, the dark 40-footer rose open-mouthed through school after school, pitching baitfish high into the air and making a whitewater disturbance that amused anglers on the wooden platform a half mile away.

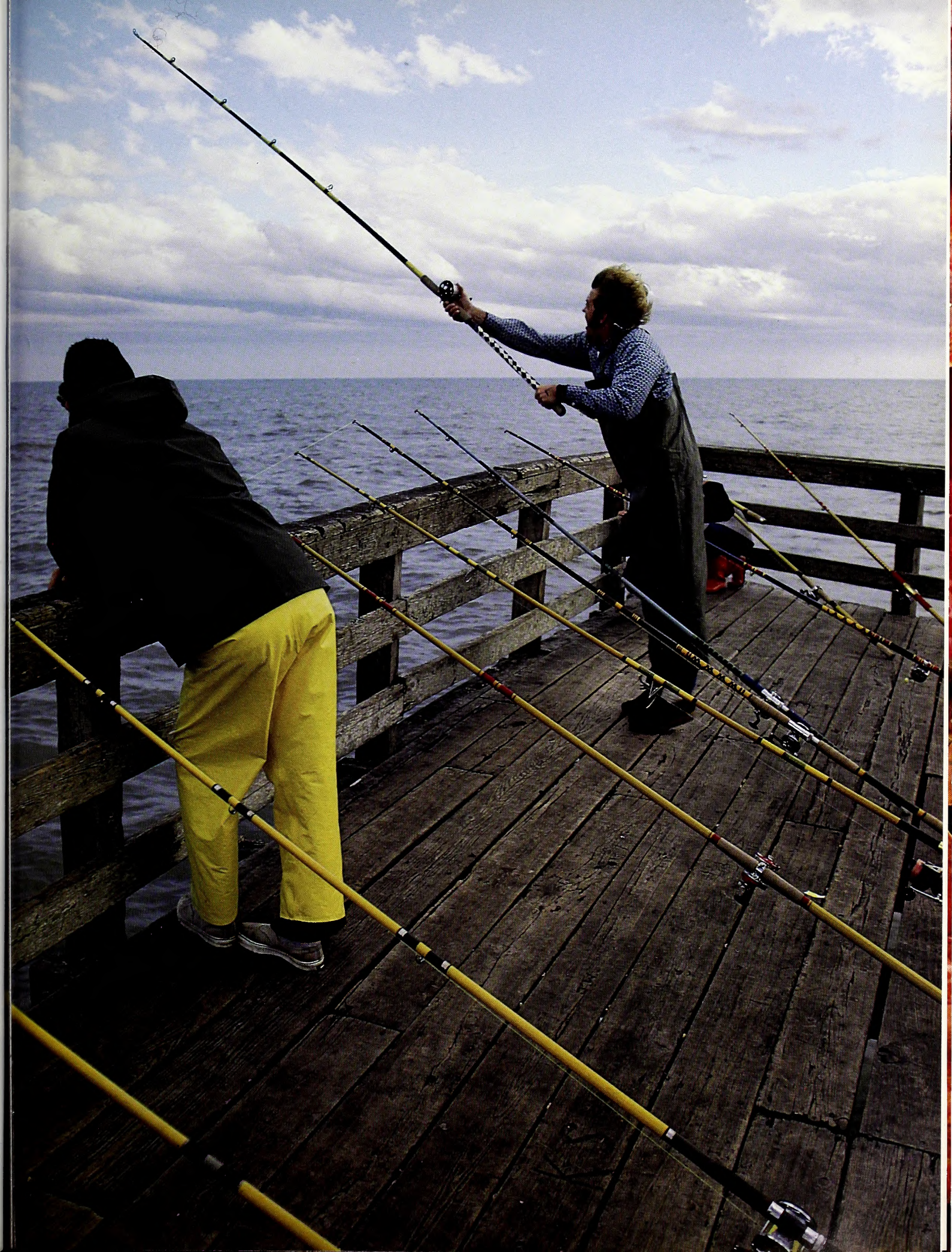
"It's hanging around here for the same reason drum do," Gaspeny said, backing away from the rail to give a caster room. "On a southwest wind, menhaden hang in the lee of the beach. That's what attracts drum in the fall."

Gaspeny—a native of nearby Virginia Beach and, for 15 years now, a fishing guide at Islamorada, Florida—knows a thing or two about red drum, having fished the upper Outer Banks with zeal, authority and admirable success every fall since 1965. In 1988 he spent a month fishing in Virginia before returning to his November haunts on the Outer Banks and later was awarded the North Carolina Saltwater Fishing Tournament's top prize for red drum releases, a total of 46. To qualify for a release citation, a red drum must measure 40 inches in length, a bigger fish than most anglers see all season.

Gaspeny caught many of those at Avon Pier, for years probably the best single location in the state for trophy red drum in November. A storm took the end off a few years ago and, until it was rebuilt, Avon Pier produced poorly. It produced better afterwards, but Pat Bracher—another regular and no doubt, with his twin brother, Arch, among the best drum fishermen in the country—said it would be even better if it were a little longer. Unfortunately, the pier has been closed to the public since 1989. The pier is owned by the National Park Service as part of Cape Hatteras National Seashore, and it was closed when difficulties arose over privately owned parking. However, anglers are hopeful that the pier will reopen at some point.

The reasons for good fishing at Avon Pier reveal the essence of big drum fishing, which is putting and keeping a bait where fish are most likely to be. "It's hard to hold bottom where there are breaking seas," Bracher said. "You've got to fish beyond the breakers into deeper water."

Of course depth varies with the tide. As it falls, your bait lies in shallower water and seas may begin breaking there.



When the height of a wave equals the depth of the water, it "breaks" or curls over, applying much more pressure to your line and moving your bait. Consequently most fish are caught on high tide, whether day or night. When Avon Pier was still open experts agreed that a dawn high tide with a southwest wind around the full moon in November was the most likely time to catch a red drum from the pier.

Hatteras Island has been trophy drum country over the last 50 years, and experienced anglers have learned that depth is the most important factor to shore fisherman success, not bottom type or structure. Contrary to what some anglers and writers have speculated, nothing off Avon Pier attracts drum particularly. Bracher said that if another pier the same length were built a mile away, it probably would produce just as well.

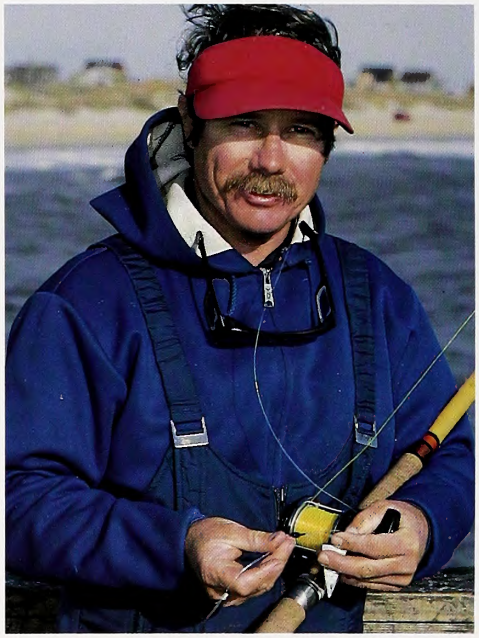
Hatteras Island Pier at Rodanthe, just a few miles north, for example, is another good location. A March storm in 1989 took 100 feet off the end, but repairs are expected to be completed by fall. Fishing there starts earlier, about October 10 to 15, but ends early in November most years. Avon Pier's fishing begins later and continues until about Thanksgiving.

"There is reportedly live coral off here," Bracher said, looking across the Atlantic Ocean. "My theory is that as big drum migrate out of Oregon Inlet and down from Chesapeake Bay, they seem to go as far as Cape Hatteras then turn offshore, where they overwinter. They may hold on those coral outcrops until a northeast wind moves them, or a southwest wind makes a nice lee for migrating bunker. Then they move in here, just like the whale."

Anglers who can cast far enough to reach deep water are likely to score, but holding bottom is key. Among the fall regulars is champion caster Larry Haack. Gaspeny and the Brachers are also in that league (Pat won the 1989 drum release award in the N.C. Saltwater Fishing Tournament with 34 releases), but few visitors or casual drum fishermen have the skill and strength to successfully fish for drum off the piers, or in the surf, for that matter. A handful of capable anglers from local villages and inland cities, however, can be found among the pier regulars in October and November.

The importance of casting is reflected in pier drum tackle. Anglers generally agree that one type of gear is best: heavy conventional rods of 10 feet or more, generically called "Hatteras Heavers," with revolving-spool reels and monofilament line testing 20 to 30 pounds. Nearly all these rods are custom-made. Experts favor the Ambassadeur model 8600 (now discontinued) and Nine reels, as well as the Penn 980.

Fishing on a pier for big red drum is of necessity a social sport. Anglers crowd together, fishing more or less from the same spot to the same spot. Cooperation is essential, and the very end of the pier, which is often reserved for drum fishing, is no place for a child or inexperienced angler. Conditions require that everyone use similar tackle. If someone is fishing 6 ounces of lead and the others are fishing 8, the smaller pyramid may roll over the other, well-anchored lines, reducing opportunity for anyone to catch a drum. Interlopers will meet complaint.



***Fishing guide Vic Gaspeny** is one of the best red drum anglers who frequent the Outer Banks when the red drum begin their fall run. In 1988, Gaspeny released 46 red drum, all over 40 inches in length.*

Bracher said that if currents were excessive for an 8-ounce pyramid, drum probably would not feed there anyway. He said they like moving water, not calm but not extremely turbulent water.

Experts know what winds produce best, but not necessarily why. Gaspeny said that currents are less extreme on a southwest (offshore) wind. Traditionally a northeast (onshore) wind was good here, and it still is, but regular fishermen have noted that recently southwesterlies produce better. Curiously, a northwest wind, also offshore, yields little.

Bracher said that big red drum are now found only around bait concentrations. Only a few years ago, they were also found away from bait. "It's because there are fewer big fish now," he said.

Other drum anglers and guides agree. Capt. Norman Miller at Ocracoke, one of the most successful drum guides in the country, has for years commented on the declining numbers of what he calls "old warriors," the large, thick and well-scarred drum at the top of the population pyramid. The number of drum entered in the North Carolina Saltwater Fishing Tournament, however, reached a 15-year high in 1988, undoubtedly reflecting increased drum fishing, increased participation in the contest, and reduction in the minimum size limit for drum eligible for a release citation. In 1987 that length was reduced from 45 to 40 inches, while the minimum size for a citation if the fish is killed was raised from 40 to 45 pounds. The number of drum released in the contest has grown to over 82 percent since release awards were first offered. Last year the number of drum entered in the state contest declined from 408 to 335.

What kind of fish lures an angler like Vic Gaspeny from the sunny marl flats of south Florida to the cold, windy Outer Banks in the fall? Red drum, also called redfish and channel bass, among other monikers, are one of the most sought-after game fish in the South (the red drum is also North Carolina's state fish). Early in this decade, the Gulf of Mexico population came under such heavy commercial pressure that in 1986 managers issued an emergency decree to stop netting in the federal zone offshore. Fishing there remains illegal today. Across the South in the last few years, states have progressively tightened commercial and angling restrictions. In 1988 Florida became the fifth state to ban commercial sale.

Studies directed by N.C. Division of Marine Fisheries (DMF) biologist Jeff Ross are attempting to get a better understanding of the local red drum population. Fish here in the northern sectors of their range attain a much larger average and maximum size than anywhere south of us. Nearly all the world record fish come from Pamlico Sound and Chesapeake Bay or nearby ocean waters.

Ross wants to find out how long drum live, when and where and at what age they spawn, where they migrate and what percentage of them we are catching. His investigations, begun in 1983, are to be completed next year, so conclusions have

Pat Bracher, *another excellent red drum fisherman, shows off a 50-pound red drum taken in 1978. Unfortunately, big fish like this are becoming rarer. Throughout their range, red drum have been exposed to intense fishing pressure, both from commercial and recreational anglers.*

not been drawn. However, some preliminary findings are noteworthy. Red drum have been thought to live a long time, but only recently has a technique to determine their age been validated. Some large fish, including the all-tackle world record specimen that weighed over 94 pounds, had 50 to 55 growth rings in their ear bones (otoliths). Ross and other researchers now accept that one ring is laid down each year. They will now be able to gain important insights into any red drum population's age composition.

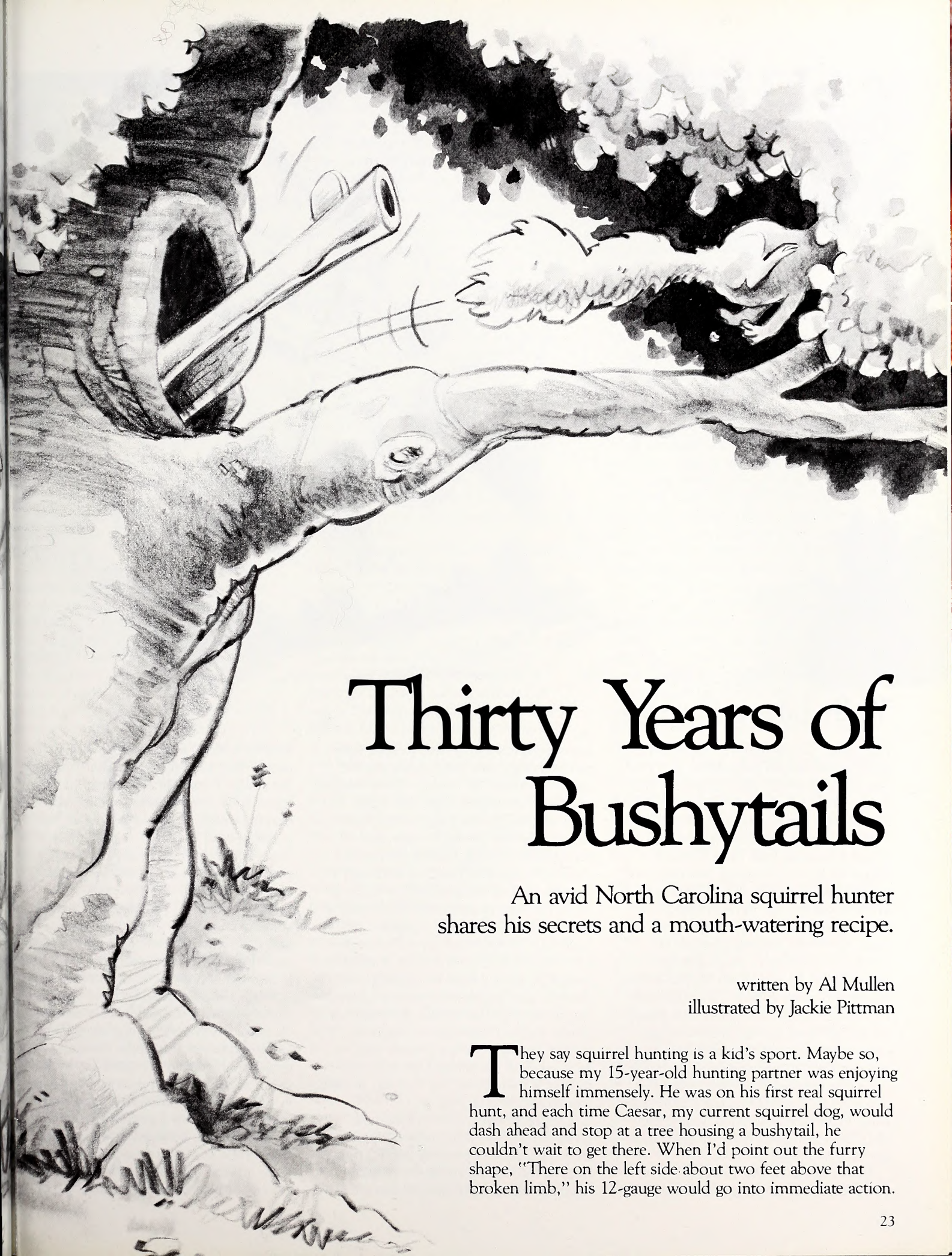
To determine when drum spawn, Ross examined reproductive organs from fish sampled from commercial and recreational fisheries and from fish contributed by sport fishermen. Preliminary results indicate spawning occurrs in August and September.

DMF figures reveal that yearling drum tagged in the mouth of the Pamlico River and across Pamlico Sound on Hatteras Island grass flats had high recapture rates. On average, 21.3 percent of these young fish were caught. Fishery biologists use recapture rates to measure exploitation. The rule of thumb, Ross said, is that about twice as many total fish are caught as the number of tag returns. These numbers indicate that almost half of Pamlico River's young red drum are being caught within five months of reaching legal size, an alarming finding to many who are concerned about excess harvest.

DMF officials have declined to increase the minimum size limit, presently at 14 inches. However, beginning on January 1 this year, DMF imposed tighter harvest restrictions, including a five-fish creel limit. Now anglers can keep only one fish 32 inches in length or longer, as compared to two previously, and the DMF has capped the commercial catch at 300,000 pounds annually; if that level is reached—it never has been—the season that year will be closed in North Carolina.

Since 1988, scores of sport fishermen, including Gaspeny and the Bracher brothers, and several fishing clubs have participated in DMF's tagging project. Contestants in surf fishing tournaments tag for the program as well. Clients of Capt. Norman Miller at Ocracoke tagged more than 500 drum in 1989. Because of Miller's success, by far most fish were tagged at Ocracoke Inlet, but substantial numbers were caught from Hatteras Island north of Cape Point, from the area between Topsail Inlet and Bald Head Island, and from Hatteras and Drum inlets.

While research continues, red drum fishing remains quite good at certain locations, but some anglers complain that success has fallen off elsewhere, with more fishermen than ever catching fewer fish each. Creel surveys under way by DMF and the National Marine Fisheries since 1987, however, show the North Carolina recreational catch down only eight percent by number and up 18 percent by weight through the 1989 season. These annual surveys, together with accumulating knowledge from Ross's research, should yield a substantial scientific basis for future management decisions. ⊠



Thirty Years of Bushytails

An avid North Carolina squirrel hunter shares his secrets and a mouth-watering recipe.

written by Al Mullen
illustrated by Jackie Pittman

They say squirrel hunting is a kid's sport. Maybe so, because my 15-year-old hunting partner was enjoying himself immensely. He was on his first real squirrel hunt, and each time Caesar, my current squirrel dog, would dash ahead and stop at a tree housing a bushytail, he couldn't wait to get there. When I'd point out the furry shape, "There on the left side about two feet above that broken limb," his 12-gauge would go into immediate action.

Walk Like a Squirrel...

And when Caesar retrieved his squirrel, a smile would spread from ear to ear. He was obviously enjoying it almost as much as the "kid" (now nearly 50) escorting him though the woods on the hunt.

For 30 years, I've been hooked on squirrel hunting. Ever since a school friend took me out on my first hunt with an old three-legged hound named Lucy, I knew it was for me. When I was 25, all my hunting buddies turned to deer and quail, but I was learning more about "slipping the woods" after squirrels. When I was 35 and all my friends in the ministry became golfers, I was still training squirrel dogs. Now that I have passed 45 and all those my age are becoming couch potatoes—you guessed it—I'm still out there in the woods.

To commemorate all these years that I've enjoyed squirrel hunting and to share some hints with other kids, young and old, I have compiled these 10 guidelines for squirrel hunters.

Don't Walk in the Leaves. A few years ago, I had to laugh at a friend of mine from Iowa who tried to stalk squirrels as though they were pheasants. He charged through the middle of the woods and came up empty, while I shot the limit slipping on the edges. When you step on the first dry leaf, every squirrel for a hundred yards hears it. If there's a clear path, use it. If there's a field near a woods, walk in the grass before slipping up to the edge of the trees. When you've shot a squirrel or two at one place, go back into the field and slip to the next. One extremely dry fall, I even donned waders to get my limit by walking slowly down a small creek. If you must hunt a woods through the middle, do it after or during a rain. I once had to shake my foot at a squirrel during a misty rain. Not only had it not heard me enter the woods, it thought my leg was part of the tree trunk I was leaning on.

Use Your Eyes. Always look near forks of trees or on top of bent trunks. If there's a yellow poplar tree and 20 more trees in the woods, check the poplar first. For hiding squirrels, poplars are a favorite. Oaks, hickories and pines are farther down in preference. Even look in the cracks! A couple of years ago, I was "getting the raspberries" from an old hunting buddy of mine when I told him a light spot in the crack of a split poplar was a squirrel. Then, he ate his own raspberries when I shot and a squirrel slid out the bottom of the crack. I learned that trick from a squirrel barking at me from inside a gum log 20 years ago. It took me 15 minutes to find it that time. Remember, wherever you don't look, that's where the squirrel might be.

Walk Like a Squirrel. Have you ever really watched a squirrel cross a woods? He takes a hop here, a jump there, stops, looks and listen! If it works for the squirrel (and rabbits and deer) it'll work for you. I'm not a patient person. I can't sit in one spot all day like some of my friends, waiting for a couple of squirrels. To compensate, I learned to walk a little, stop a little. If a squirrel is barking, walk while it talks. Stop walking when it stops talking, or maybe one step before. Con-

tinuous noise or movement is a red flag to bushytails.

Know Your Gun and How to Use It. Don't shoot to cripple. I hate to see a wounded squirrel crawl into a hole to die. Pass up that shot at 50 yards with number 8s and an open-choke shotgun. Old squirrels have very tough hides and a lot of pellets do not penetrate far enough, especially when you take those long shots. Learn how far you can kill a squirrel and try to get closer if necessary. I use number 7½s, and I use a full-choke 12-gauge when the leaves on the trees make rifle hunting difficult. For most shotguns, number 6s are probably best. For a .22-caliber rifle, I use hollow points. Sometimes it destroys some meat, but not many squirrels get away wounded.

Shoot the Front End. If I see someone get under a tree and shoot at a squirrel climbing straight up above them, I know that they don't eat squirrel. Once you shoot up the rear legs and back, you don't have much meat. Err by missing the head when shooting, not by hitting the rear end.

Of course getting at the right range and making a clean shot on a squirrel is not always as easy as some of your non-squirrel-hunting friends will tell you. One of my favorite memories is the day Bubba and I were hunting with his fice. The dog treed, and as his son and I rushed ahead, we heard Bubba's 20-gauge bark behind us. We whirled to see another squirrel 75 yards away dive into a hole unhurt. "Too far," growled Bubba. Just as he finished speaking, the squirrel that the fice had treed thought the time was ripe to exit. It jumped out of the tree and ran within 3 feet of Bubba. Again the 20-gauge roared as the second squirrel safely hit a hole. "Too close," Bubba fumed. The rest of the day, Bubba's son and I kept reminding the fice to be sure and tree a squirrel at just the right distance for his master.

Hunt with a Friend (at least, at times). Not only can you kid each other when you miss, but reliving and retelling old tales can last a lifetime. Besides, two is a good number for hunting squirrels. One walks while one watches and then you swap rules. This takes away a squirrel's master strategy of staying on the back side of a tree. One person with a rifle and one with a shotgun is the best possible combination. A rifle is good for the still shots and the shotgun for the running ones.

Hunt with the Weather, Not against It. If it's windy stay home and watch TV, shine your shoes, watch your garden grow or whatever else excites you. You'll only get cold and aggravated hunting in the wind. Also, forget the first light of dawn if it's only 15 degrees F. I froze on many frosty mornings before I realized squirrels were smarter than I was. They were still warm in bed. However, if it dawns sunny and warm after a cold night, or two rainy days, that's a different story. Look for that time in the morning or evening when it's just a little quieter, stiller and brighter, and when it comes, get your gun. A better tip is to watch that squirrel living in your yard. (For heaven's sake don't kill it!) When it starts feeding you know every other squirrel is probably doing the same. One Saturday last December, it had been windy and blustery all day. After about the fifth shower, the sun came out and the wind died. Immediately, I dropped my hammer and nails, laid aside my barn-building project and grabbed my rifle. In less than an hour, Caesar and I were back home with five plump squirrels in the bag.

When Squirrels Run Fast, You'd Better Be Fast, Too. When a squirrel sees you and begins running or when you miss the first shot and a squirrel is just a blur in the trees, don't hesitate. Either shoot fast or run to catch up and then shoot fast. The squirrel knows every den in the woods, and once it starts for home, it seldom changes its mind. I've seen a squirrel jump out of the top of the highest tree in the woods or come down a tree within a foot of two hunters and a dog to get to the safety of its den. If you think you can shoot one at the last moment, as it flies up that hollow just before it vanishes into its hole, you have been listening to too many quail hunters that say shooting squirrels is really easy. When a squirrel takes off, take the first decent shot. You may not get another one.

Train a Dog. If you really like squirrel hunting, train your own squirrel dog. It will give you twice the pleasure. Feists, hounds, beagles, mutts and many other dogs can become squirrel dogs. I've had several varieties. Presently, I claim to have one of the largest squirrel dogs around, a 100-pound registered German shepherd that can find squirrels by sound or scent. All I've done to train my dogs is to find a woods with lots of squirrels. Then I take the dog there often and encourage and praise him when he does the natural thing—chase them up a tree. Use some simple word or words when you are looking for the squirrel or when you see it and he doesn't. Then when you go to the woods to hunt, use the same words. Pretty soon, he'll be looking for squirrels every time you repeat them.

I have two warnings for squirrel dog trainers, however. Don't train the dog while riding a bike. Once when I was riding my bike to the church where I was pastor, I saw two squirrels playing near some trees in the churchyard. Amos, a hound that I was then training, was running beside me, and I raced my bike across the lawn shouting, "Get the squirrel! Get the squirrel!" In my excitement, I hit a large drain hole in the lawn. In my clean shirt and tie, I somersaulted over the handlebars and landed with the bike on top of me. This ended my dog training from a bike.

Also, don't show off your dog in front of an audience. At the same church a year later, some painters were working. Returning from a hunt, I stopped to check on their progress. They inquired about my hunting and my dog. Being proud of Amos, who was blossoming as a squirrel dog, I told them to step behind the church, where I knew some squirrels lived, and I'd give them a demonstration. Sure enough, Amos immediately treed in perfect fashion. However, as I backed around the tree to shoot, I was so intent on giving a good show that I forgot the creek behind the tree and managed to step right off the 5-foot bank and hit the deep, icy water flat on my back. The painters clapped, cheered and shouted at the amazing demonstration..

Learn to Bake a Great Squirrel Pie. The last ingredient that makes squirrel hunting such fun is eating the results. I've eaten squirrel fried, baked, barbecued and stewed, but my favorite way is in a pie. Here's my recipe:

Place 5-7 squirrels and a little pork (2 chops or an equivalent amount of a cheaper cut in a large pot). Barely cover the meat with water. Boil until the squirrels are tender when stuck with a fork. Cool them and take the meat from the broth. Take all the meat off the squirrels and the lean meat from the pork, and put the meat in a piecrust. Salt and pepper it and dot with 2 or 3 tablespoons of margarine. Sprinkle with 2 or 3 tablespoons of flour and fill the pie about two thirds full with the broth. Add a top crust and bake at 350 degrees. Top with gravy made by browning 3 tablespoons of flour in 2 tablespoons of margarine. Then add about 2 cups of broth and simmer until slightly thick. (You can add 2 chicken bouillon cubes to the gravy for even more flavor.) ⊠

If that license looks familiar, you may already know one of the new ways the state is raising cash to acquire valuable lands.

written by Lawrence S. Earley
illustrated by Jim Brown

Conservation organizations and state agencies have known for years that the best way to protect an important natural area is to buy it. It's thorough, safe and final. It's also the most expensive approach and brings up a big question: Where do hard-pressed state agencies get the cash to acquire land?

Thanks to a couple of new programs, and one relatively old one, there are some answers to that question. Now you have three ways to put your assets to work for conservation in the state. One uses a tax incentive to encourage donations of land. Another relies on the popularity of personalized license plates to raise money to acquire natural areas, while the third depends on tax-time generosity to fund the management of endangered species and other nongame animals. Each of these programs is designed for pocketbooks of varying sizes. The tax credit program might appeal to business and private landowners, while the others are available to just about anyone with an interest in wildlife and habitat and just a little cash.

Take a look at these programs and you'll find something that fits your wallet—and your heart.

Personalized License Plates. Okay, try this one: "T42NU4ME." It's a personalized license plate, of course. Half the popularity of these plates has been in seeing how many words you can cram into eight characters and still get your point across. Fun, yes, and now valuable as well because since 1989, every personalized license you buy kicks in $10 to the Natural Heritage Trust Fund.

The Trust Fund was established in 1987 to award grants to state agencies for the acquisition and management of lands of special value and for inventories of endangered ecosystems. In its first two years, the fund helped the state purchase easements along the New River in Alleghany County, made a down payment on a 585-acre piece of land in Polk County that was added to the Wildlife Commission's Green River Game Land, and purchased 175 acres of Buxton Woods, the largest maritime forest remaining in North Carolina. Inventories

of remnant longleaf pine stands and mountain wetlands were also carried out using Trust Fund moneys.

All of this was accomplished out of a meager pot of only $275,000 provided by the 1987 General Assembly for the fund's first two years of operations. But in 1989, the legislature added a continuing source of income for the fund by raising the price of personalized plates and earmarking income from sales of those plates for the fund.

A personalized plate costs $40, compared to $20 for a regular plate, so it's not cheap. But that extra $20 goes a long way. The Natural Heritage Trust Fund gets $10, while the other $10 goes to the Personalized Plate Fund for highway beautification, the promotion of tourism and accessibility for disabled persons.

Fears that the price hike would depress personalized plate sales have not been borne out. "The initial experience has been positive," says Richard Bostic, fiscal analyst with the state's Fiscal Research Division. The Personalized Plate Fund decreased by only $1,355, out of total revenues of over $1.7 million, while the Natural Heritage Trust Fund grossed over $1.1 million in only nine months. "Once people start realizing that the money for these plates is being used to buy land, they might buy even more plates," says Bostic.

For more information about the Natural Heritage Trust Fund, write: Natural Heritage Program, Division of Parks and Recreation, Department of Environment, Health, and Natural Resources, 512 N. Salisbury St., Raleigh, N.C. 27611.

Conservation Tax Credit. Anyone who donates land for conservation purposes to the state, a local government or a conservation group can claim a tax credit of up to $25,000 on the appraised value of the property, according to the provisions of this recently overhauled program. Conservation purposes are defined as access to public beaches, public waters and public trails, and fish and wildlife conservation.

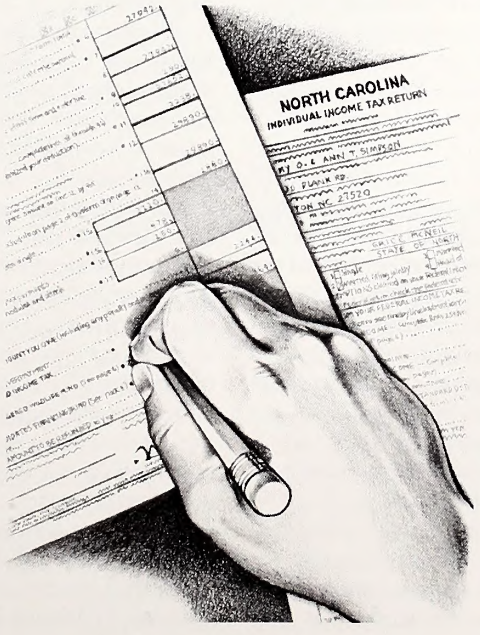
Begun in 1983, this incentive program originally provided a modest tax credit of $5,000. It wasn't enough, says Bill Flournoy, chief of the Environmental Assessment Section of the Department of Environment, Health, and Natural Resources. "The amount of the tax credit allowed was not sufficient to interest the business community, for example, and it was felt that if it was going to be a tool that would stimulate donations of land, then maybe a higher tax credit was needed."

In 1989 the General Assembly raised the tax credit from $5,000 to $25,000, and Flournoy expects that the program will become "a valuable conservation tool."

Flournoy says he hopes that corporate donations will be stimulated by this new incentive, but some sizeable transactions have already been made. The 182-acre Pinnacles of Kings Mountain in Gaston County, valued at $1 million, was acquired by bargain sale and turned over to the Division of Parks and Recreation for its Crowders Mountain State Park. Another landowner received the maximum tax credit each year over three years when he made a three-part donation of 200 acres south of Lumberton. The N.C. Wildlife Resources Commission has added to its Branch and Bullard Hunting Preserve Game Land.

In addition, there have been several gifts to the Nature Conservancy and to local governments. "In Troy, a woman gave her home to the town, just one third to one half of an acre of land," says Flournoy. "The town used her yard and gardens for a park and bird sanctuary."

To receive certification of the conservation value of your property, write for an application form from: Assistant Secretary of Natural Resources, N.C. Department of Environment, Health, and Natural Resources, P.O. Box 27687, Raleigh, N.C. 27611.



NORTH CAROLINA
NONGAME &
ENDANGERED
WILDLIFE
FUND

Nongame and Endangered Wildlife Fund. This Wildlife Commission program has proved to be a enduring source of revenue for the management of endangered species and other nongame wildlife in the state, and also for the acquisition of land. Since 1983, over $2.25 million has been raised.

Tax-checkoff revenues have supported the restoration of bald eagles and peregrine falcons and the protection of the loggerhead sea turtle. The Commission has devoted some of this money to colonial water bird management and to the purchase of valuable bottomlands along the Roanoke River.

Most of the income has come through a checkoff box on the state's income tax form, although direct contributions can also be made. When you fill out your state income tax form, enter a donation from your refund on the appropriate line. Last year, 48,220 people donated a portion or all of their state tax refund to the fund.

For more information, or to contribute to the fund, write: Nongame and Endangered Wildlife Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188. ⊠

Proper Release Will Help Them Survive

Roanoke Striped Bass Can Still Be Caught, Not Kept

Written and Edited by Vic Venters

Although the harvest of the Roanoke River's striped bass population was stopped this spring, anglers may still fish for "rocks" as long as they release the fish. The N.C. Wildlife Resources Commission and the N.C. Division of Marine Fisheries shut down the harvest of striped bass as part of an effort to restore the Roanoke striper population, which has plummeted since the 1970s.

If you continue to fish for stripers, fishermen should take special care in handling and releasing these fish. Striped bass do not seem to tolerate the stress of being caught as well as some species like largemouth bass. In particular, they seem susceptible to secondary bacterial and fungal infections caused by handling. While mortality rates for stripers caught and released are not currently known, biologists with the Wildlife Resources Commission and the Division of Marine Fisheries suggest you follow these simple guidelines to make sure released stripers survive.

- Use barbless hooks or flatten hook barbs with pliers.
- Release stripers while they are still in the water by using a dehooker or pliers.
- Minimize the use of landing nets or bringing the fish onboard.
- Cut line close to the hook on gut-hooked fish, and avoid using stainless steel hooks that will not deteriorate.
- Handle fish only when necessary.

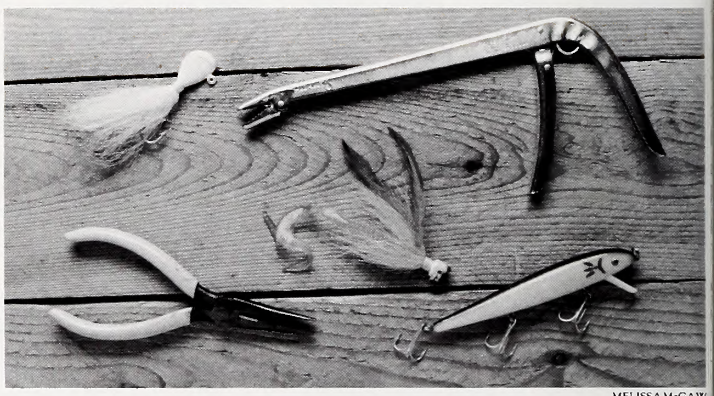
The striper harvest ban went into effect last May after sport fishermen reached a yearly quota recommended by the Atlantic States Marine Fisheries Commission (ASMFC). The quota is based on an 80-percent reduction from harvests in the mid-1970s. Earlier in the spring, the commercial harvest had likewise been curtailed.

The Roanoke population of striped bass is managed jointly by the Wildlife Resources Commission and the Division of Marine Fisheries.

Failure by the Wildlife Commission and Marine Fisheries to adhere to the recommended quota could have resulted in the federal government taking over the management of striped bass fishing in North Carolina. That action possibly could shut down the striper season permanently, Wildlife Resources Commission officials said. Harvest of Roanoke stripers will be closed until January 1991.

The Wildlife Resources Commission and the Division of Marine Fisheries are working on a management plan to restore the population to historic levels. A key element of this plan is an 80-percent reduction of the striped bass harvest by 1992. Although all the factors are not fully understood, inadequate river flows during spawning periods in the early 1980s, declining water quality and excessive commercial and recreational fishing contributed to the reduction in population numbers.

The management plan is scheduled to be submitted to the ASMFC in 1992. The ASMFC is an organization comprised of northern and mid-Atlantic states and the federal government and is authorized by Congress to manage marine fisheries along the Atlantic coast. The ASMFC has issued striped bass harvest quotas for other states from Virginia to Maine. North Carolina has been exempt from quotas in the past because the Roanoke River/Albemarle Sound striper population was considered a separate population from the equally troubled Atlantic Ocean/Chesapeake Bay striper population.



MELISSA McGAW

Tools of the Trade: *Hooks with bent-down barbs, a pair of pliers, and a dehooker will minimize any handling of striped bass that are to be released.*

While rivers like the Tar, Neuse and Cape Fear support stripers, the Albemarle Sound and its adjacent waters contain most of North Carolina's striped bass. The Roanoke River is the major spawning area for these fish. While a low population forced the closure, there is a case for cautious optimism. This year saw an excellent run of two-year-old stripers. "The present Albemarle-Roanoke population of small striped bass is encouraging, the largest in 10 years, resulting from good reproduction during 1988 and 1989," said Dr. William T. Hogarth, Director of the N.C. Division of Marine Fisheries.

"It is vital that we avoid taking too many of these young 14- to 18-inch fish. We need to give a good number of stripers an opportunity to reach maturity and spawn, which takes four to five years. We are beginning to see the striper make a comeback from recent low numbers, and it is important that we help that trend continue."

With use of the proper release techniques, the majority of stripers caught should live to be caught again and contribute to another quality fishing experience.

—Angela Dorman Hill and Vic Venters

National Hunting & Fishing Day

Tungsten/Plastic Shot Appears in England

New Nontoxic Shot May Replace Steel Shot

You don't have to spend a lot of time in a duck blind to hear hunters grousing about steel shot. "It doesn't kill at longer ranges," is one common complaint. And many hunters have had to retire a favorite old double gun because of the damage steel can do to the barrels of a vintage shotgun. But with millions of waterfowl and other birds estimated to be dying due to poisoning from lead shot ingestion, nontoxic steel shot has been a trade-off hunters have had to accept. Already mandatory in many North Carolina counties, the use of nontoxic steel shot will be required throughout the state and rest of the nation in the 1991-92 season. Until recently, steel shot has been the only viable nontoxic alternative to lead.

There are, however, some interesting developments brewing in the nontoxic shot industry in Britain that may revolutionize the hunting scene. A cartridge containing nontoxic tungsten/polymer shot has been developed by Royal Ordnance Specialty Metals of England. The new shot, being sold in England by cartridge manufacturer Eley Hawk, has ballistics similar to lead. Not only is the shot nontoxic if ingested by wildlife, it also should be usable in older shotguns that have barrels too thin, too soft, or too tightly choked to accommodate steel shot.

Tungsten is almost twice as heavy as lead and Royal Ordnance has combined it in a powdered form with a polymer to form shot pellets. Weighing about the same as lead, these pellets are reported also to deform much like lead when travelling up the barrel, thus preventing damage to it, reports the Wildlife Management Institute in Washington, D.C. The pellets resume their original shape when the compressing forces are removed, thus providing tighter, shorter and more lethal shot strings that hit harder than steel at longer ranges. Lead pellets do not resume their original shape, which suggests the new pellets may prove to be ballistically superior.

In addition to being nontoxic, Eley Hawk's new cartridge will be "green," incorporating a biodegradable shot shell and shot wad. The shells were due out in England this summer and were to sell for about the equivalent of $14 per box, said Michael McIntosh, a noted firearms writer.

Don't look for this shot on the shelves here in America just yet, but at least one major American manufacturer is interested in licensing the technology for the U.S. market, McIntosh noted. If the tungsten/polymer shot comes to the market in the U.S., the shells might retail for as much as $25 per box. "This tungsten shot will always be more expensive than lead because it has to be manufactured," McIntosh said. "The estimates are for it to be about four times as expensive as lead, at best."

Still, for aficionados of fine old shotguns, or those who need longer-range shells, $25 per box may seem a cheap price to pay.

Steel Shooters: *By the 1991-92 waterfowl season, nontoxic shot will be required across the state and nationwide. However, a new non-toxic plastic/tungsten shot developed in Britain offers superior ballistics to steel and could one day provide a better nontoxic shot substitute.*

Volunteers Needed for Big Sweep

Trash Pickup Planned for September

For the 3,600 volunteers who turned out for last year's Big Sweep trash cleanup, you can take a big bow. The Big Sweep has won its third consecutive Take Pride in America national award.

Last year, Big Sweep netted 81.5 tons of garbage from the beaches of Nags Head to the shores of the Nantahala River. It is the nation's only statewide waterway cleanup. The annual cleanup of North Carolina's beaches, rivers and lakes was one of 89 winners in the annual competition.

Volunteers are again needed for this year's Big Sweep, scheduled for September 22. As debris is picked up, the type of litter removed will be recorded on data cards for analysis to be used later for developing educational activities to reduce pollution. For instance, last year, post-Sweep analysis showed that plastics comprised over 60 percent of North Carolina's beach debris.

To volunteer for Big Sweep 90, call 1-800-27SWEEP. Additional information can be obtained by writing Sea Grant, Box 8605, N.C.S.U., Raleigh, N.C. 27695-8605. Promotional T-shirts can be obtained by sending $8 plus $1 postage to the same address. Big Sweep is coordinated by a consortium of university programs, nonprofit organizations, private companies and state agencies, including the N.C. Wildlife Resources Commission.

Wildlife Prospers on "Sloppy" Farm

Tips Will Help Small Game on Your Farm

When you begin hunting quail and rabbit on your favorite farm this season, ask yourself whether the land supports as much wildlife as it once did. If it does not, alterations to small game habitat may be part of the problem. Here are a few tips you may want to discuss with the landowner before the next planting season, or steps you may want to take if you own the land.

A well-kept farm with its closely mown ditches, clean fencerows and cropland conveniently tilled in continuous row crops is a desert to most wildlife. If you'd like to see more small game, give them places to escape, travel or nest, such as hedgerows, fencerows and brush piles.

Be sloppy—let your farm grow up a little. Plant 10-foot-wide field borders around your cropland using either shrubs or low-growing vegetation. It shouldn't be mowed any closer than six inches. Plant your ditchbanks with lovegrass, switchgrass or other warm-season grasses that provide excellent nesting cover.

No-till farming is another way to improve nesting habitat by providing more year-round cover. Strip cropping can also offer food and travel lanes. With a contrast of dense cover and open fields, a farm could be a perfect haven for small game. Food shouldn't be a problem for quail chicks that eat mostly insects. Establishing plots to provide food and valuable cover could improve the survival and reproduction rates of bobwhites and cottontails, though.

Prior to next April, consult a Wildlife Resources Commission biologist and/or your local Soil and Water Conservation District to obtain free seeds for wildlife plantings. For instance, last spring the Buncombe Soil and Water Conservation District purchased and distributed wildlife materials, including packets with switchgrass, bicolor and Korean lespedeza, browntop millet, birdsfoot trefoil, ladino clover, and lime and fertilizer. Buncombe, and other counties also offer cost share assistance. *Article reprinted courtesy of the Buncombe County Soil and Water Conservation District.*

JAY DAVIES

Small Game Talk: *Landowners can help small-game populations on farms by taking a few steps to increase food and cover for rabbits and quail. Consult your local wildlife biologist for more details.*

Contest Recognizes Conservation Efforts

Begin Taking Pride in America

For the fourth year, North Carolina will participate in the Take Pride in America awards program for 1990. Take Pride in America (TPIA) is a national and statewide campaign to increase awareness of the need for wise use of natural and cultural resources, and to encourage a sense of stewardship and responsibility toward public lands through volunteerism. The awards program was established to recognize outstanding efforts conducted by individuals and organizations on behalf of our state's and nation's public lands.

This spring, Earth Day kicked off 1990 as the "Year of the Environment." Groups or organizations involved in public land stewardship and awareness efforts are encouraged to apply. The awards program is open to any individual and to public and private sector groups that have contributed to the increased wise use of America's resources. The activities for this awards cycle must have been initiated, accomplished or ongoing in 1989 or 1990.

Last year, 30 groups were recognized as winners by Governor James G. Martin. Those winners were submitted for consideration at the national level. North Carolina was honored by having 11 groups selected as national winners, making 1989 the third consecutive year that our state ranked first among participating states.

Nominations are due Nov. 2 and need to be submitted on an official application. For more information, contact John Poole, State Coordinator for Take Pride in America, Division of Parks and Recreation, P.O. Box 27687, Raleigh, N.C. 27611-7687, or call (919) 733-7795.

Field Notes

Season openings, closings and regulation changes:

Eastern Bow and Arrow Deer	Sept. 10
Central Bow and Arrow Deer	Sept. 10
Western Bow and Arrow Deer	Sept. 10
Northwestern Bow and Arrow Deer	Sept. 10
Mourning Doves	Sept. 1
Rails, Moorhens and Gallinules	Sept. 1

More detailed information on seasons, bag limits and other regulations is found in the *1990-91 North Carolina Inland Fishing Hunting and Trapping Regulations Digest*, which is available from license agents. Information on waterfowl seasons may also be obtained from license agents.

Simmons Boat Still Built on Coast

Dear Editors:

I was interested in the short article on the Simmons Sea-Skiff in the Back of the Book in the June issue. We visited Mr. Simmons's yard in the 1950s and negotiated for one of his boats. I recall that the price was around $350 but we wound up having a spritsail skiff built at Harkers Island instead.

My reason for this note, however, is to mention a couple of things which might warrant amplification.

We have understood the generic term "sea-skiff" to apply to certain lapstraked wooden boats made on the New Jersey coast, characteristically with round bilges and inboard power. These boats evolved on the Jersey coast because of their ability to run breaking inlets.

The Simmons Skiff, as it was generally called, owes more of its heritage to the New England dories, with a hard chined design, a lot of rocker in the sheer line, and with a raked transom. What the Simmons Skiff and Jersey boat have in common is that they are pretty boats, and they are singularly well adapted to the areas in which they evolved.

The other matter worthy of mention is that a gentleman named Nelson Silva, who moved from Maine, has a shop in Wilmington at which he restores old Simmons Skiffs and also builds new versions of the boat, with a fiberglass bottom having built-in flotation and with the traditional wooden strakes from the first lap upward. I have visited his shop and have seen his version of the Simmons Skiff under construction and finished. He does nice work. Thus, your statement that "you'll have to build it yourself" is not quite correct.

R.D. Darden Jr.
Morehead City

Editor's Note: *Nelson L. Silva & Co. of Wilmington does indeed build modern versions of the Simmons Sea-Skiff and refurbishes old Simmons Skiffs as well. Like the original Simmons boat, it is marketed under the name "Sea-Skiff." For more information, Nelson Silva can be reached at 919 686-4356.*

Cast Us A Line...

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit any correspondence. Please send to Letters Dept., *Wildlife In North Carolina*, 512 N. Salisbury St., Raleigh, N.C. 27604-1188

Features Cottontail, Beagles

Sportsman's Stamp, Art Print Available

North Carolina's 1990 sportsman stamp and print feature a pair of beagles in pursuit of a cottontail rabbit. Wildlife artist Roger Cruwys of Bozeman, Montana captured this traditional North Carolina scene. Buyers of the annual sportsman license receive the sportsman stamp each year. The prints are available through art dealers. The 1990 print will be on sale through Dec. 31, 1990. After that time, remaining sportsman stamp prints will be destroyed. A new Wildlife Resources Commission policy requires that all unsold art prints be destroyed six months after the accompanying license stamps expire.

—Angela Dorman Hill

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Status on June 30, 1990

	Numbers Sold	Revenue Received
Lifetime Sportsman's License	49,769	$18,829,303.96
Lifetime Hunting License	654	186,295.05
Lifetime Fishing License	3,918	919,948.94
Lifetime Subscriptions to Wildlife in N.C.	2,027	280,804.28
Contributions	—	179,019.18
Fund Total	56,368	$20,395,371.41
Total Interest Earned		$6,153,837.84

Calendar

September 15

Willamette Industries Inc. will sponsor a wildlife seminar at the Lions Building on the Lee County fairgrounds in Sanford at 7 p.m. Various speakers will be discussing whitetail deer management in the Carolinas. For more information call Eddie Campbell at (919) 542-2311.

September 15-16

Ninth annual Currituck Wildlife Festival, Currituck County High School, Barco. The festival will feature the N.C. duck, goose and world swan calling contests, as well as wildlife art, wood carvings, decoys, crafts, photography and food. Proceeds go for the proposed wildlife museum in Currituck County. For more information, write Currituck Wildlife Guild, P.O. Box 91, Shawboro, N.C. 27973 or call Nancy Wright at (919) 232-2962.

September 22

The Big Sweep '90 will clean up trash and debris from North Carolina's beaches, lakes and rivers. Volunteers are needed! For more information or to volunteer, call 1-800-27SWEEP

The 1991 North Carolina Wildlife Calendar Is Here!

The works of Bob Timberlake, Patsy McAuley, Walt Obman, Bob Herr, Robert B. Dance, Jake Taylor, Robert C. Flowers Jr., James A. Brooks, Judy Mizell, Duane Raver and Dan Johnson are featured in the 1991 Wildlife Calendar. Order yours today by returning the form below with your check or money order to 1991 Calendar, N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

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For fund raising and bulk rate information (10 calendars or more), call 919-733-7280. Please allow 6 weeks for delivery.

CALO91

The 1991 North Carolina Wildlife Calendar is here.

"Cape Lookout Morning"
R.B. Dance

R.B. Dance's painting of Cape Lookout Lighthouse (pictured above) is just a sample of the fine art featured in the 1991 North Carolina Wildlife Calendar. To order your calendar, see Back of the Book section Pgs. 29-31.

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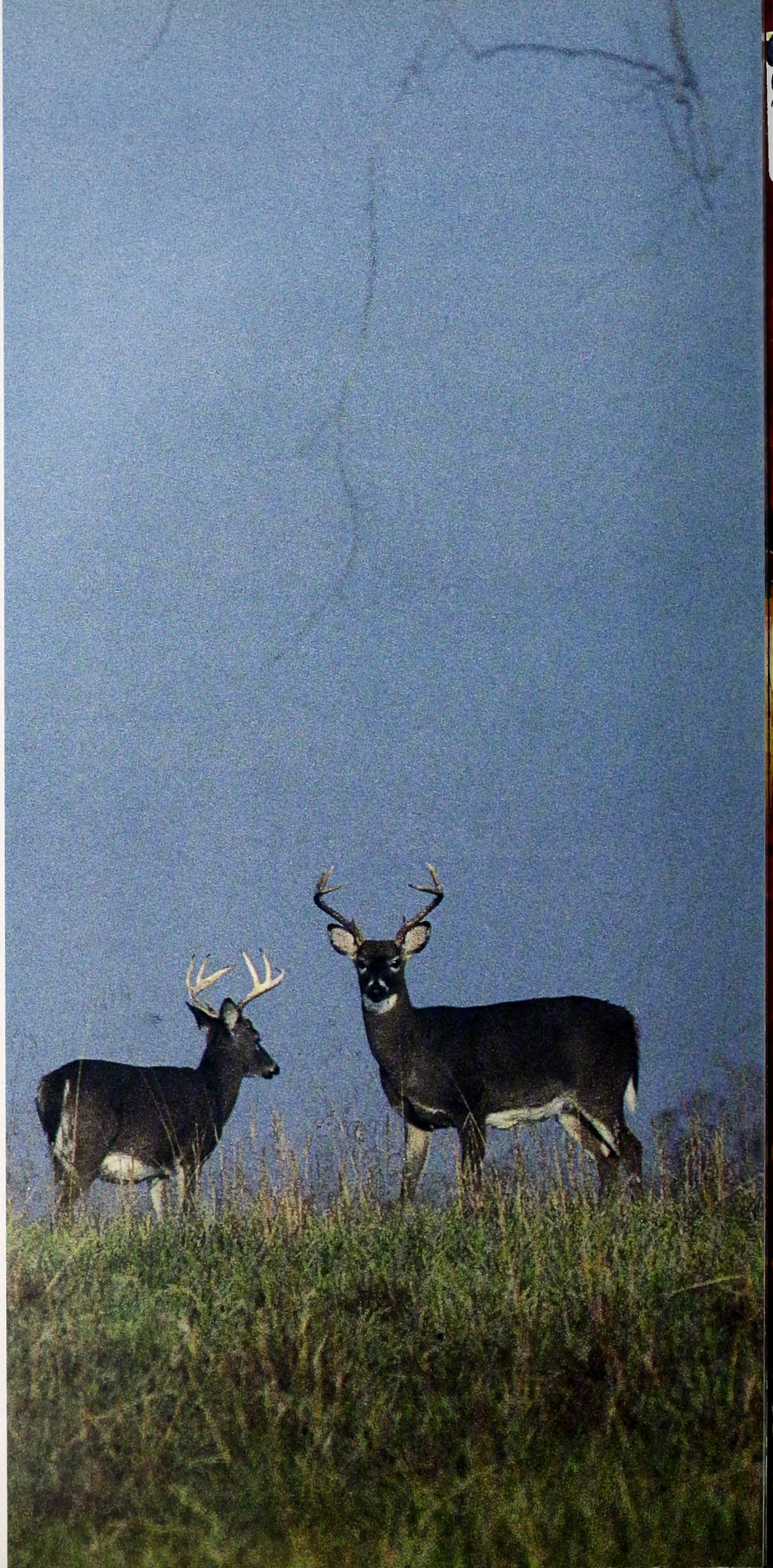

Whitetail Morning

As the morning mist dissipates in this meadow, these whitetailed deer will soon scatter into nearby dense cover where they will be safer.

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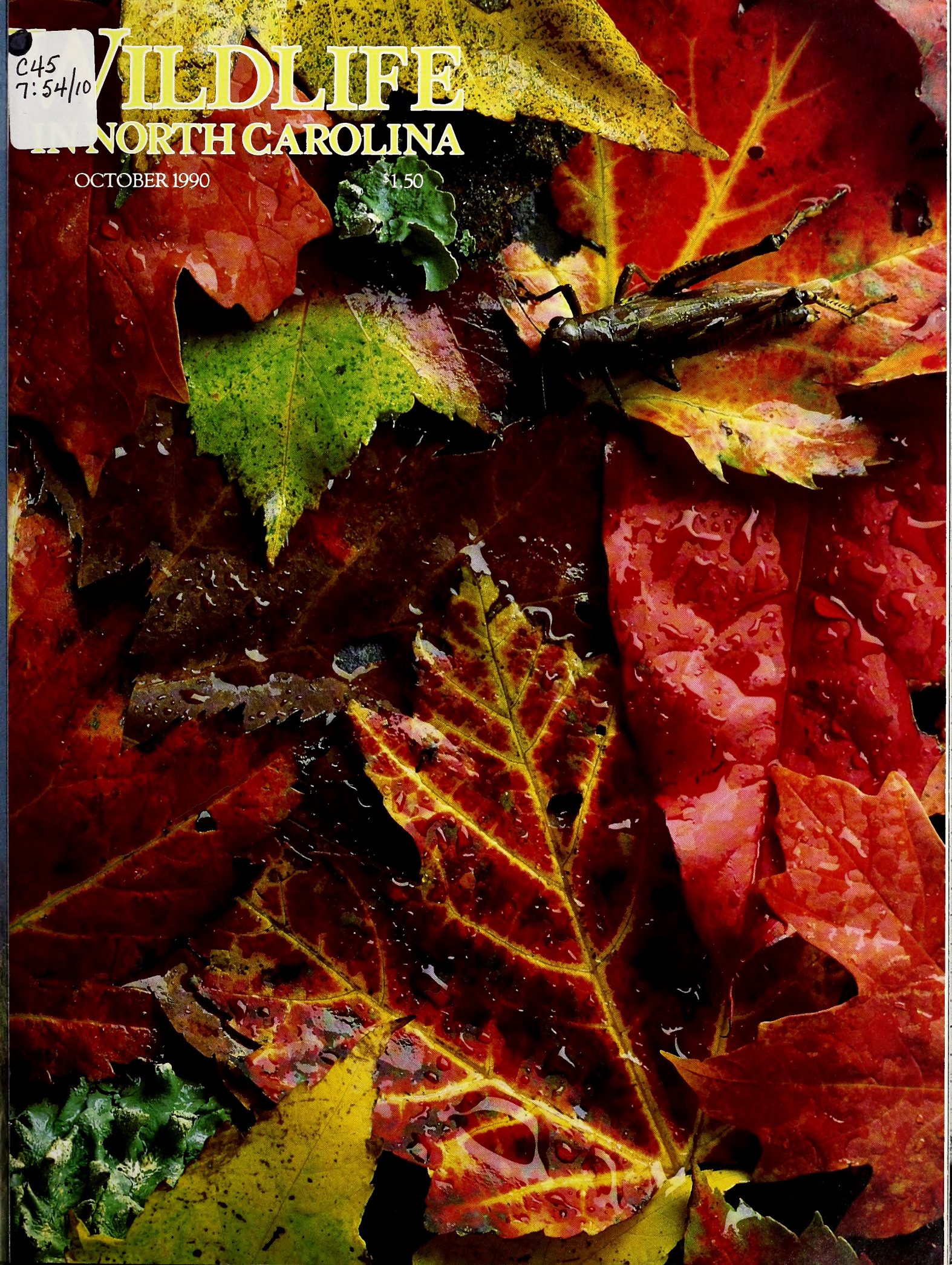
OCTOBER 1990 $1.50



Live Entertainment

by Jim Dean

We had fished a remote trout stream and hiked out a steep trail. The supper dishes were stacked, and the katydids and lightning bugs were preparing the evening's sound and light show. With no phone or TV in the tiny mountain cabin, I was anticipating a long evening of reading followed by the blissful sleep of the (presumed) innocent. I've learned, however, that the combination of a full belly and a book is premeditated slumber, so one more ritual seemed in order.

"I think I'll take a walk," I told Jack.

"Good idea," he said. In the gathering twilight, we meandered down the dirt path under a black canopy of hemlocks that glittered with bioluminescent bugs. At our feet, hovering fireflies cast eerie ovals of light on the road as though probing their way with tiny flashlights. Here and there through the trees, we could catch a glimpse of the nearby stream, the riffles shining faintly under a thin slice of moon. We walked towards the distant mercury vapor light in front of the old clapboard store. As we reached it, Jack suddenly stopped.

"Look at the size of that toad!" he exclaimed. "And that one over there. They're nearly as big as cantaloupes."

Not only were they huge, they also seemed perfectly comfortable with uninvited company. Both continued to hunt the grassy fringes alongside the store for insects drawn to the light. The largest had taken a position beside concrete blocks that supported the porch. It sat motionless much of the time until it spotted a mole cricket, moth or other insect. Then it would turn its head and look directly at its target, perhaps even taking a hop in that direction if necessary. The toad's long, sticky tongue would gather the meal faster than we could see. Goodbye cricket.

"This is great," said Jack, settling down for a lengthy stay. "Who needs public television when you can get a front row seat for the real thing. I'll bet those toads have been here for many years. No one bothers them, they've got a good home under the store and there's almost never any traffic on this dirt road, especially after dark."

We were shortly joined by a strolling family that found the show equally enthralling. Toad tales were shared. "When I was a kid, I used to roll lead shot down a board in front of feeding toads," confided one visitor. "Toads are attracted to movement, and they'd lap up every passing shot until they were too heavy to hop. Of course, we'd pick the toads up and pour out the shot, so I hope we didn't do them any permanent harm."

"Yeah, I remember doing the same thing," admitted Jack. "We also fed them lightning bugs—they love 'em—and after they'd eaten them, they would glow like Chinese lanterns."

"Do you suppose one of these toads would eat a meal this big," I said, pointing out a mottled beetle over 2 inches long that had fierce-looking claws and a disposition to match. Jack probed the beetle with a stick, and it attacked aggressively. Jack placed the beetle in front of the largest toad. The beetle was still clinging to the stick with its claws and grasping a large piece of bark with its feet. The toad eyed it with interest.

"I'll bet he doesn't eat that," someone said.

With astonishing quickness, the toad lapped up the beetle, and daintily wiped the stick and bark off its chin with its toes. Inside the loose white skin of its throat, we could see evidence of a struggle.

"He can't stand that," said Jack. "He's sure to spit it out."

Our toad sat serenely like a diner at a late-night donut palace. Goodbye beetle.

Back home, I consulted my toad references and learned some rather amazing facts about these common animals. Under favorable conditions, toads live a long time. Maximum age is unknown, but one captive toad lived to be 36 years old before it was killed accidentally. Toads must fill their stomachs four times a day, and they apparently limit their intake to anything that will fit, even bees, wasps and spiders. Slugs are special treats. Toads are such effective pest controllers that they are often gathered and placed in gardens. According to one study, a toad can eat nearly 10,000 insects in 3 months. The two most common, and nearly identical, species found here are the American toad, *Bufo americanus*, and the Southern toad, *Bufo lentiginosus*.

Toads don't drink, but absorb water through their skins, and they seem almost to sigh and swell with pleasure when they settle down like a sponge in a puddle. You may have witnessed the enormous congregations of toads that are attracted to warm, wet highways during an evening summer rain. Once, returning from the beach with my kids, we encountered hundreds of toads hopping across the wet macadam. As I slowed down and began dodging, Scott offered a suggestion.

"I think you'd better turn on your frog lights," he said.

In the back seat, Susan groaned.

October 1990
Volume 54, Number 10

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *As the fable goes, the grasshopper would be well-advised to take a busy ant's advice this time of year and stock up for winter instead of fiddling. But amidst so much fine weather and riotous color, it's tough advice to follow. Photograph by Melissa McGaw.*

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Hunter's Moon

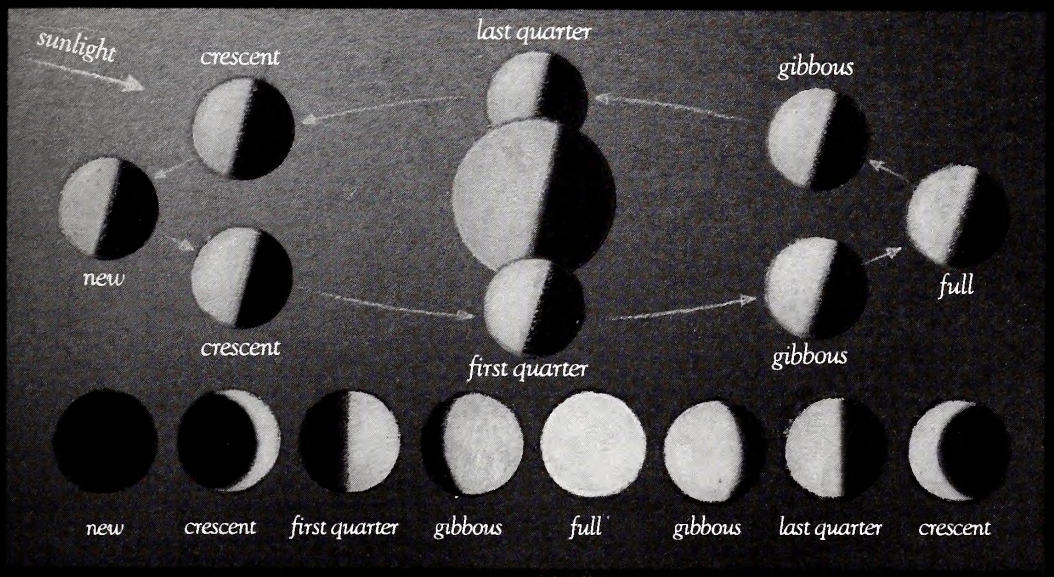
written by Lawrence S. Earley/illustrated by David Williams

People have always been a little ambivalent about the moon. We've worshipped it as a beneficent force—in some cultures, a moon growing toward its fullness is considered a time of good luck, so endeavors are begun during this time and infants are exposed to the moon's salutary light.

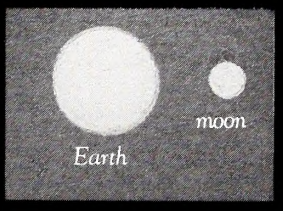
But then there's the folk suspicion that moonlight is not all that healthy. Consider our words "lunacy" and "lunatic." They derive from "luna," the Latin word for moon, and refer to a condition of certifiable madness, a condition once thought to be caused by exposure to the moon's baleful influence. And someone who's "moonstruck" is crazy, in love, or engaging in idle reveries, sometimes all three at the same time.

What no one disputes is that since the dawn of human consciousness, the moon has functioned as a critical element of our notion of time. Before watches or other mechanical timepieces, our forebears realized that the moon in the night sky had a different shape, or phase, each night. There was the pale, ghostly, colorless light of a full moon; there were crescent moons of various sizes; and for several nights the moon was completely invisible. Most important, from the point of view of telling time by the moon, these phases appeared at regular intervals. With this knowledge, ancient humans had a useful unit of time between the day (measured by sunrise and sunset) and the year (measured by the passage of seasons).

The moon's phases are caused by the relative alignments of the earth, the moon and the sun during the moon's 29½-day orbit around the earth. When the moon is between the sun and the earth no light falls on it and so the moon is dark (the new moon). In the days after the new moon, a tiny crescent becomes visible and grows larger on subsequent days until in about a week half the moon is



Relative size of earth to moon



***The moon has different** shapes, or phases, in the night sky, ranging from a full disk, or full moon, to no moon at all. These phases are caused by the relative positions of sun, moon and earth as the moon travels its 29½-day orbit around the earth. The sun and the moon appear to be the same size because though the sun is roughly 400 times the diameter of the moon, the sun is also about 400 times farther away.*

visible. This is called the "first quarter" moon. In another week the moon is on the far side of the earth, bathed by the sun and we have a full moon. The time from the new moon to the full moon is known as the "waxing" (or growing) moon.

The moon then gradually loses its fullness until about a week later it becomes half full again (the last quarter moon) and in another week disappears. This is the period of the "waning" moon. The process from new moon to new moon takes a little over 29 days—or, to be exact, 29 days, 12 hours, 44 minutes and 2.78 seconds.

How can you tell whether the moon crescent is a first-quarter or a last-quarter moon? Writer George Gamow suggests a method that relies on easy French. Add an imaginary vertical bar over the open side of the moon. Thus adding a bar to a crescent shaped like ☾ makes the letter "d" (☌)which refers to the French word *dernier* meaning "last." But a bar added to a crescent shaped like ☽ creates the letter "p," refering to *premier* or "first"(☍).

Each month, the full moon appears in the eastern sky an average of 50 minutes after the sun sets in the west, but the delay varies greatly. In the spring, the moon may rise as much as 80 minutes after sunset, while in September and October, the delay may total only about 22 minutes. These autumn full moons have had a special significance to farmers and hunters. Indeed, they were (and still are) termed the Harvest Moon and the Hunter's Moon respectively because the extra hour of light was helpful to the work of farmers and hunters.

There is a host of folk traditions regarding the moon, many of them assembled by the Reverend Timothy Harley in 1885 in a curious book titled *Moon Lore*. The new moon was considered the best time for beginnings—building houses; marrying; counting money. A full moon was the time for cutting timber, mowing grass, making hay. In English folklore, a Christmas that fell during a waxing moon predicted a good year, but a Christmas during a waning moon meant a bad year was sure to follow.

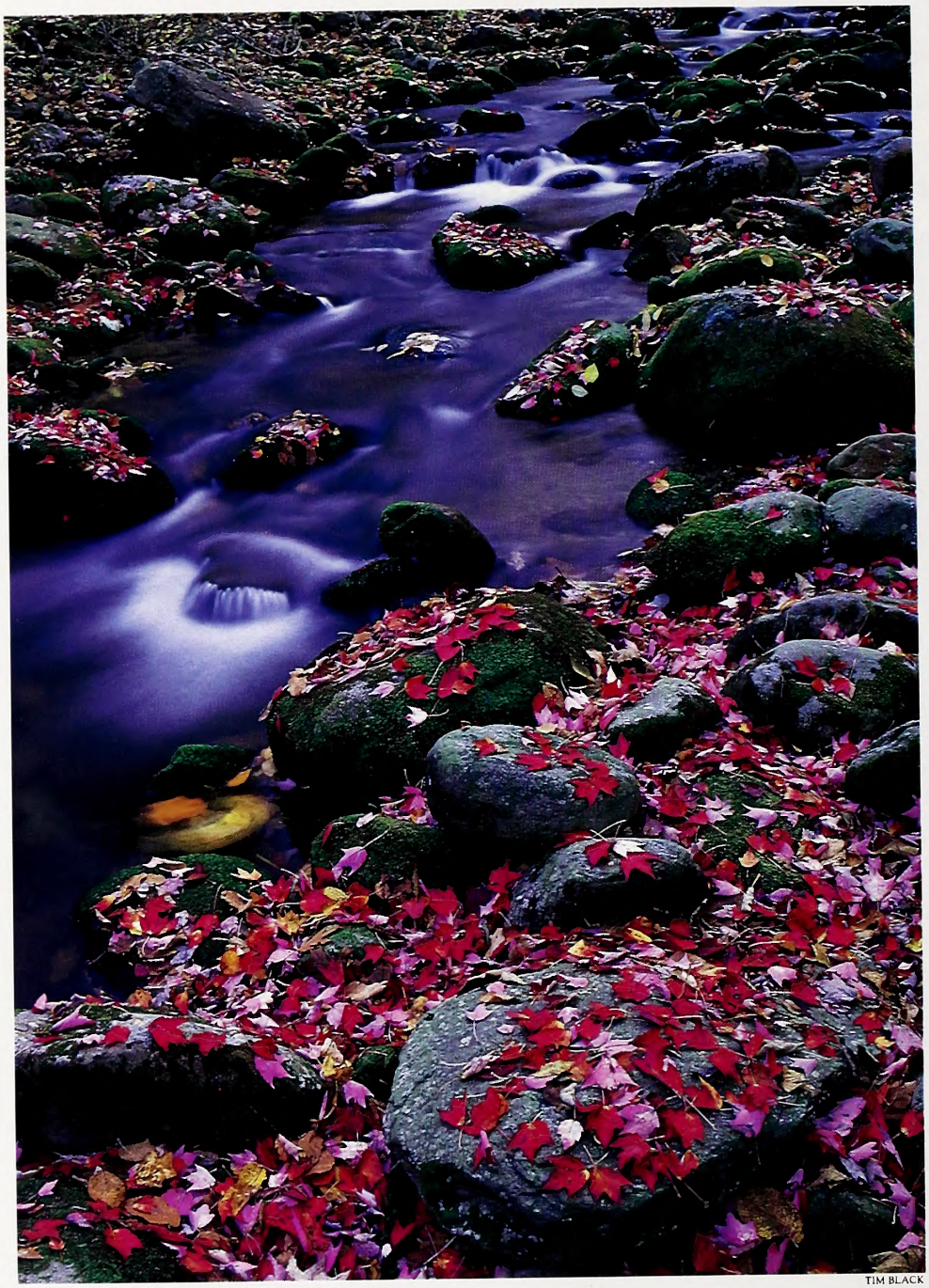
This month, watch for the Hunter's Moon on the 4th.

RIVERS OF COLOR

Is it merely an impression that autumn's colorful palette is richer along rivers and streams, or do leaves on trees growing near water actually glow with more intensity?

photographed by William S. Lea and Tim Black

WILLIAM S. LEA



TIM BLACK

Against a waning tide of green, autumn begins to unfurl its colors along mountain streams as random flagbearers appear carrying bright yellow, orange or claret banners. Some hues are more subtle, yet no less lovely. The eye automatically frames wine-dark, wet leaves clinging to the boulders in a brook.

The loss of chlorophyll reveals the brighter colors in fall's leaves, and a particularly steep gradient causes water to plummet, but that dry explanation hardly captures the magnificence of a waterfall dressing for its most colorful outing of the year. Autumn's appeal is based on an innate appreciation of art, not science, as shown in a still life of leaves and pine needles collected randomly in a quiet pool.

TIM BLACK

The Morning Stand

Where a moment before there was nothing, there is now a deer.

by Mike Gaddis ©1990

Dawn breaks cold, damp and somber. The sky is clabbered with thick, gray clouds. They seem low enough to touch. Somewhere in the distance, a crow barks a few arrogant notes of complaint. Otherwise, it is still.

In the dark before day, I nodded drowsily in the glow of the body heat from my walk to the stand. Then the cold bettered my outer defenses, numbing my toes and fingers, and threatening the down vest protecting the sustaining inner boilers of my upper body. Now, even more vulnerable by my forced immobility, I am uncomfortable. That will have to be. I will let it serve my vigilance. Darkness is receding and I must be alert.

My surroundings are slowly becoming interpretable. What seemed a distinct possibility a few minutes before now looms as only an isolated stump. I study each shape and form until it is in perspective and committed to memory. Again and again, my eyes search for a slight movement, something remotely out of place. Looking away sometimes, then back, waiting for an apparition to materialize. Straining intensely, listening for a telltale sound. A slight rustle of leaves brings me to attention, but the staccato beats that follow have the wrong rhythm. Only a squirrel. Before the sun rises a gray fox minces past, prospecting for breakfast. Prolonged rustling an hour later, and a bevy of quail scurries by in route to a nearby beanfield. The minutes slip by. The weight of the stillness and the

WILLIAM S. LEA

monotony of the surroundings become almost claustrophobic. I wait.

I sense something, a feeling I cannot explain. It tells me to be intensely aware. I am no longer cold nor uncomfortable. My eyes are directed to a slender break in the dense brush beyond a blowdown. Where only a moment before there was nothing, there is now a deer. I did not see or hear it coming, but it is there. I can make out the white fringe of its tail against a hindquarter. It is a fairly large deer. I cannot tell more. I wait for it to move. When it does, I start the slow ascent of the big rifle to my shoulder but stop midway. There is another deer 20 yards behind the first, and another trailing that one. I must remain frozen.

All three have stopped. The first deer is a doe. She knows something is wrong but cannot find it. I am well hidden. She stamps her foot nervously for a time. The muscles in my arms and shoulders are growing ever more weary from the weight of the rifle. I am shaking and fear that I will be discovered. Finally, the doe picks her way forward. The others follow. When the cover obscures their view, I ease the rifle to my shoulder. It is the deer behind that draws my interest. I search for a moment with the scope until I find it. I can see only a shape. I move the scope ahead to a slight break in the cover. The deer will walk through this opening momentarily. I am nervous and feel the elevated beat of my heart. The deer moves and now I can make it out, although I can see nothing but ears. Another doe! Disappointment washes over me, but only for a few seconds. They make their way past me slowly, feeding on the acorns in the leaves. It is only when they leave that I can relax and let the tension drain away.

Alone in the stillness again, 15 more minutes pass, then 30. I have now been virtually motionless for more than two hours. I am tired and I begin to think about the simple pleasure of movement. But my vigil must remain unbroken. I have confidence in my plan. I regain my former intensity. The single notes of a sparrow, in series, seem calculated to heighten the suspense.

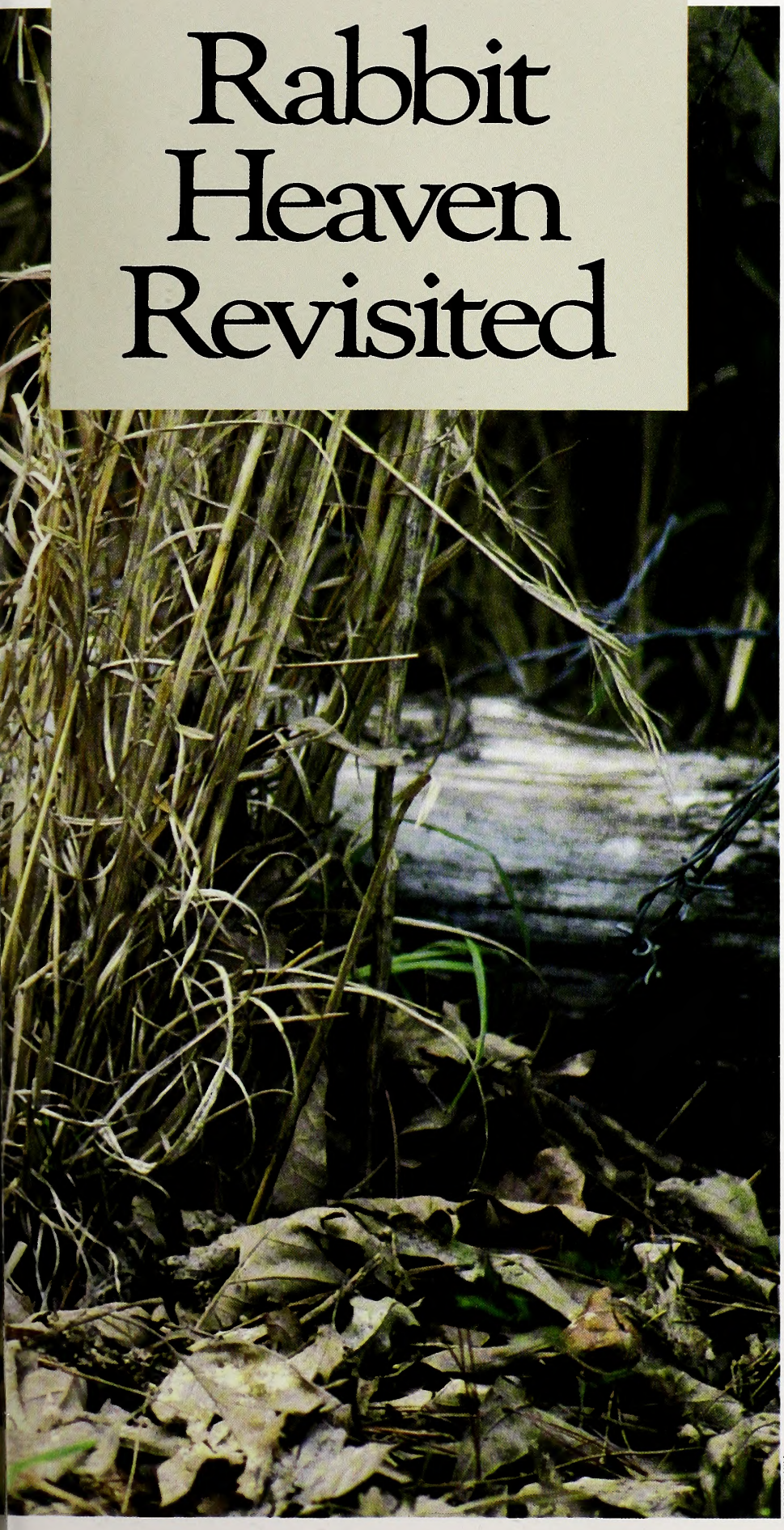
Minutes more wear by. Suddenly, an electric impulse carries the length of my body, elicited by a slight, almost imperceptible, noise from behind. I resist the urge to turn and look. I hear a slight thud, a hoof against a rock perhaps. This time I am certain. Slowly, in stages, I turn slightly to gain a better field of view. It is a deer, nose to the ground, walking steadily on the trail of the three does. I know in an instant that it is a buck. The body language is unmistakable. The distance between us is closing and I catch the dull glint of polished antlers here and there when the cover thins. They are wide and heavy. He is intent on the does. I take the opportunity to bring the rifle into position. In a few moments, he will walk into a brief opening. I train the rifle there.

I am hot and nervous again. I pray that nothing will happen that will mar my chance. I have worked months for this moment. I check for him again and my heart skips! He is no longer there! Frantically, my eyes fight the dense perimeter cover to find him. There! He has moved off the trail into deeper cover and has stopped. I know he is alert, looking, though I can see only a portion of his back. I am worried. He may simply slip back down the ridge. Hope hangs precariously on the brink of despair. But when he moves again, it is forward. He is skirting the trail, ghosting his way through the thick cover.

I will have but one chance. Twenty yards more in his line of travel the cover will thin for a few feet. If not then, it will be an opportunity lost. I move the rifle ahead, looking over the scope to follow his progress. He is coming.

The antlers look tremendous now and I am breathing heavily. It is time. I drop my eye to the scope. As he crosses its view, I move the crosshairs to his shoulder. My respect for him and his kind creates a moment of uncertainty. But I am a hunter and I have met him fairly. I am barely conscious of the report and recoil of the gun as it responds in my hands. As I recover, I see that he is down, cleanly. I am sweating profusely though the air temperature is below freezing. I am trembling uncontrollably and my breath is coming in a desperate series of gasps. Many minutes pass before I am able or ready to climb down. It is an occasion I will re-create in my mind a hundred times before I, too, die. ⊠

Rabbit Heaven Revisited



LLOYD B. HILL

Wildlife biologists thought they could create a heaven for cottontail rabbits at the Penny Bend research area merely by improving habitat. It hasn't worked out that way, and predators appear to be the culprits.

by Steve Pozzanghera

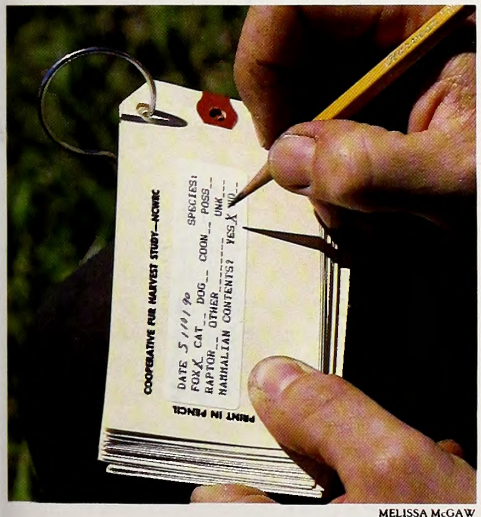
Whether you are a loyal *Wildlife in North Carolina* reader, a nature enthusiast, or a hunter concerned about the state's rabbit population, you're likely to remember an article titled "Rabbit Heaven" by Carl Betsill (*Wildlife in North Carolina*, February 1985). Five years after the publication of that article, Commission biologists still get questions about "the rabbit research area near Durham." Apparently, the idea that biologists might be able to create an ideal home for rabbits right here on earth intrigued many of you. Yet, what has happened at this so-called "rabbit heaven" may surprise you as much as it has the biologists who conceived it.

The Penny Bend Rabbit Research Area, located on the Falls of the Neuse Game Lands in northern Durham County, has been closed to hunting and managed by the North Carolina Wildlife Resources Commission since 1982. At the time of its pur-

Improving habitat *at Penny Bend has not been enough to sustain larger rabbit populations on the research area. As quality small-game habitat grows increasingly fragmented and stressed across North Carolina, traditional wildlife management strategies may need to be revised.*

KEN TAYLOR

Box trapping *(far left) allows Wildlife Commission biologists to estimate the rabbit population at Penny Bend. Once captured, each rabbit is tagged, weighed and examined (near left) to determine sex and condition. An index to the population size can be determined by analyzing how many rabbits are captured over a set period of time.*



MELISSA McGAW

As this data card suggests *(above), mammalian predators like foxes seem to be taking a toll on Penny Bend's rabbits. Large numbers of feral dogs and cats are also present, and researchers are looking to see what effect their added predation may have on rabbit populations.*

chase from a local farmer by the U.S. Army Corps of Engineers, most of the 178 acres were overgrazed pasture. Picture an expanse of 135 well-manicured football fields, add a few clumps of "broomstraw" along the sidelines and you'll have a good idea of what we started with.

Because it was obviously such poor habitat for small game, the area seemed to be a good place to begin rabbit habitat management. You may be familiar with the techniques that wildlife biologists have traditionally believed would improve such areas. Brush piles plus brier patches equal bunnies. "If you want rabbits just add the habitat," we've preached. That was our belief from the very beginning and, like all open-minded scientists, we set out to prove it. The idea was to manipulate the habitat, changing it for the good of the rabbit while monitoring the response of the population by annual box trapping.

A major portion of our early work on Penny Bend was directed toward improving the available escape cover. Removing and excluding livestock from the area was the quickest way to get existing thickets to revegetate. Annual applications of fertilizer helped speed the process. Some 30,000 blackberry and honeysuckle seedlings were planted to establish hedgerows across larger fields. Brush piles were constructed along field edges and borders, and 80 of these piles were "souped up" to give rabbits a more secure hiding place by the addition of 8-foot-long sections of 6-inch plastic pipe. Impenetrable tangles resulted from the cutting of trees in a 30-foot strip along the woods edge. Heavy fescue sod was converted to tall weeds by repeated plowing and disking. The habitat transformation on the area has been quite rapid and impressive. Today, eight years after initiating development, escape cover in the form of briers, brush piles and heavy weeds is dense and well distributed.

Efforts have also been made to provide high-quality rabbit foods on a year-round basis. Plantings and food strips are located adjacent to escape cover and arranged in narrow, winding paths. Summer browse is kept succulent by annual fertilization, and grass strips are mowed twice each month to encourage a constant supply of tender new growth. Also, clovers and grain are planted and maintained for winter browse.

Fall rabbit populations on the area have been monitored by annual box trapping. Each November, 100 box traps are set on Penny Bend for seven nights. Trap placement is the same from one year to the next and helps eliminate the variability in captures based on box locations. Captured rabbits are marked with metal ear tags and their sex is determined. Weights and measurements are taken and the condition of each rabbit is noted. An index to populations on the area is provided by the number of rabbits captured during the seven-day trapping period.

We were not surprised that the initial rabbit population on the area was low since habitat conditions were so poor. Only six captures were made during the first trapping period, conducted in 1982. As we expected, our population index (rabbits captured) tripled to 18 by the fall of 1983. The great rabbit recovery was underway!

F. ENGENE HESTER

***Quality rabbit hunting** has declined over the past decade, but sportsmen are obviously having no effect on Penny Bend's rabbit population because the area has been closed to hunting since 1982. In fact, box trappings show that rabbits were so scarce at Penny Bend that hunting would have been a waste of time despite habitat improvement measures (illustrated by map at right).*

Based on subsequent findings, however, it's a good thing we didn't call it a success and quit. From 1983 to 1987, the fall capture index stabilized at about 17 rabbits. Not to worry, we thought. The rabbit population had probably simply leveled off just prior to making that really big growth spurt. Then came the big surprise. In 1988, our rabbit captures dropped to three, even lower than when the area was an overgrazed pasture. This was a setback, but we still felt no need to panic. Small-game populations are notorious for periodic fluctuations. Perhaps a disease had hit the population. We expected a rebound in 1989. We never got it. The 1989 trapping season was a repeat of the '88 disaster with a total of three rabbits captured.

An accepted rule of thumb among rabbit researchers is that almost any rural area will yield about one captured rabbit per two box-trapped acres. During the "good" years at Penny Bend, we were capturing only one rabbit per 11 acres. In order to determine whether there were rabbits on the area that simply weren't being caught, extensive field searches were begun. The absence of rabbit sign indicated that there are not many rabbits on the area that don't get captured. Trials with beagles during this period showed that, at our population level, rabbits were so scarce and difficult to jump that attempting to hunt would be a waste of time.

If you're interested in some lively discussion, get a roomful of wildlife biologists and rabbit hunters and ask what has caused the decline in rabbit populations. Hunters are returning to areas that have traditionally provided good rabbit hunting only to find fewer rabbits for the bag. Good hunting continues to diminish from year to year. Besides the loss of habitat, you'll hear comments about the weather, genetic changes, disease, fescue and pesticide poisoning and predation (just to name a few). At Penny Bend, while attempting to maintain our focus on habitat management, we have been forced to address several of these other theories. A combination of weather and the damming of Falls Lake has caused many rabbits on Penny Bend to do the backstroke. Located next to the Eno and Little rivers, flooding of as much as 30 percent of the Research Area has occurred in three of the eight years that we have worked there (1985, 1987 and 1989). However, our population decline on the research area does not correspond with the observed flood activity. Similar areas nearby that experience the same flooding have annual rabbit populations higher than those ever obtained at Penny Bend. Given a rabbit's mobility, the short duration of the flooding periods and the amount of high ground available, we do not believe that flooding, in itself, is limiting the rabbit population of Penny Bend.

The sudden crash of our rabbit capture index in 1988 prompted a short-term disease investigation. Tularemia, a contagious bacterial disease, is known to cause severe, localized die-offs in rabbit populations and was thought to be our culprit. Blood samples were obtained from some of the other mammals at Penny Bend that could have been exposed to the disease and still survived. The samples from these "carriers" (primarily foxes, raccoons and opossums) were then analyzed for their levels of tularemia contamination. The results from that study failed to support the idea that tularemia had caused the decline in our rabbit population.

Finally, we considered the possibility that a fungus found within the tissues of tall fescue and other grasses might be the problem. Fescue has been shown to be toxic, and cattle growers are all too familiar with fescue poisoning that causes poor growth and reduced reproductive rates in livestock. Similar results have been found in studies with the New Zealand white rabbit, a domesticated cousin of our wild cottontail. These rabbits, fed a diet of infected fescue, lost weight, gave birth to fewer young and failed to raise their young to weaning age. Kentucky is currently investigating the relationship between wild cottontails and fescue. It is possible that in areas where other foods are not available, fescue may harm a rabbit population. Given the yearly smorgasbord of foods available to the cottontails at Penny Bend,

however, it is unlikely that they consume enough fescue to affect their health and reproduction adversely.

With the failure of our ability to increase rabbit populations of Penny Bend through habitat and food improvement, and after discounting the effects of weather, disease and fescue poisoning on the rabbit population, it is apparent that some other factor, or combination of factors, is limiting the population. Something must be wrong with our age-old habitat theory, yet that possibility is not easy for biologists to accept. After all, the importance of habitat, the "balance of nature" and the relationship between predators and their prey cannot be dismissed lightly—nor should they be. However, scientific wildlife managers should be able to recognize that other factors may be playing a role in the population declines.

We began to open our eyes and adjust our thinking during a snowy February in 1985. This was during the period when the rabbit population at Penny Bend was relatively small. Taking advantage of the fluffy white stuff on the ground, we hoped to track rabbits and locate some of the places they were most active. As expected, we found plenty of sign—tracks here and droppings there. The problem was that the majority of that sign wasn't made by rabbits. Penny Bend has a great diversity of habitats close by, and our proximity to urban, rural, forested and agricultural areas has brought a variety of predators within easy visiting distance. House cat and dog tracks crisscrossed the area and foxes had padded their way through nearly all our brier patches and hedgerows. Just how extensive was their utilization of the area? Could predator numbers be limiting our rabbit population?

Formal predator monitoring began in June 1986. Since that time, we have conducted quarterly predator scent-stations and bimonthly predator scat (animal droppings) collections. These will give us an accurate indication of mammalian predator use on Penny Bend. Also, investigation of the remains of prey contained within 400 scats was recently completed by the Zoology Department at North Carolina State University. It is hoped that an annual and seasonal analysis of this information may help answer some questions about the drop in our rabbit population at Penny Bend.

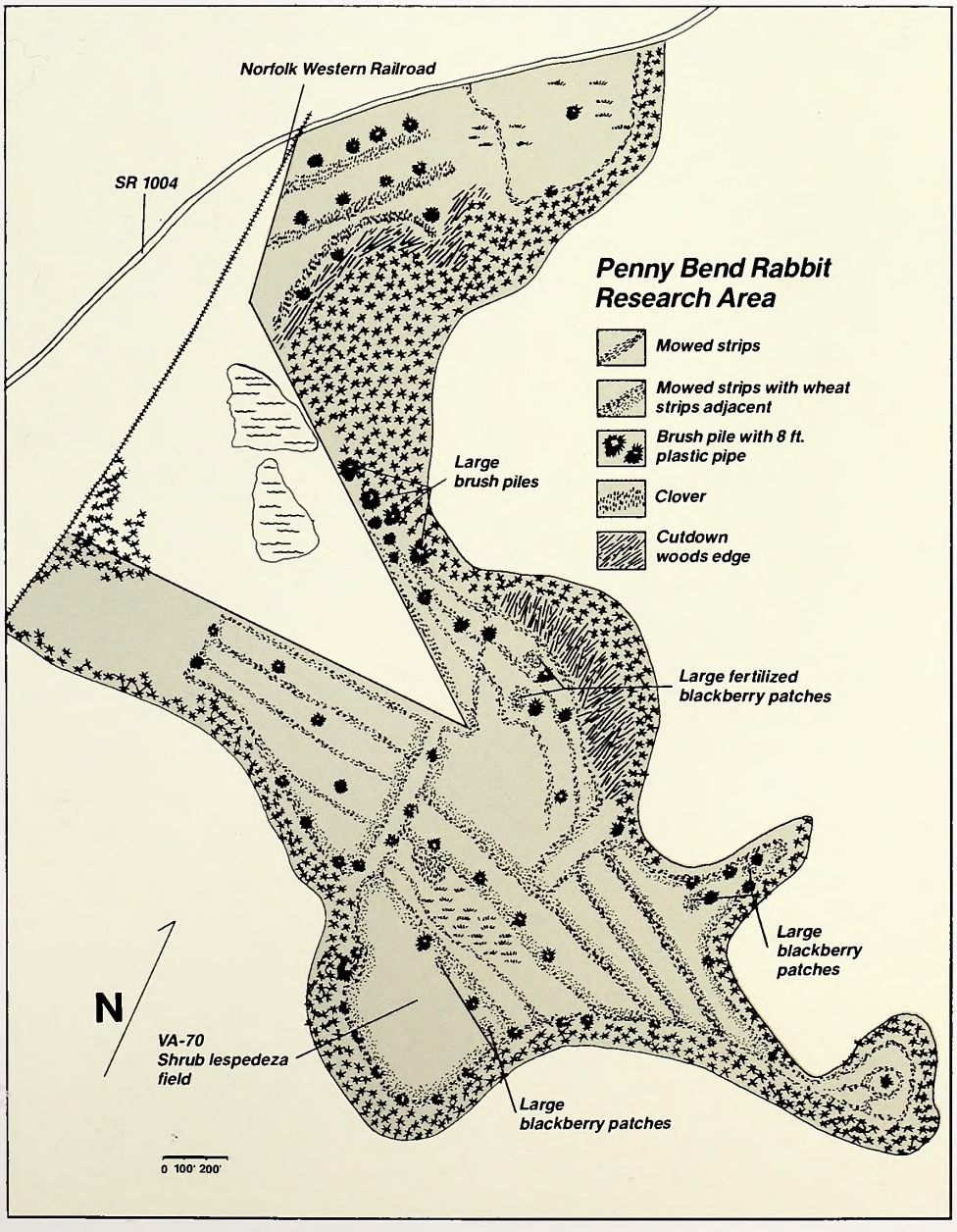
The idea that predators may limit local rabbit populations is already being "investigated" in a curious sort of way. Rabbit hunters and beagle clubs, frustrated with their sport, have begun constructing training pens where they can run their dogs. Numerous observations made at these facilities and at other privately managed farms around the state have shown us that areas capable of maintaining high rabbit populations are those that are able to exclude or remove predators. Areas with ineffective predator exclosures or management suffer from a chronic rabbit scarcity that can only be artificially remedied by annual stockings of trapped cottontails.

Although eight years of intense habitat development at Penny Bend has created what appears to be a rabbit heaven, in reality we have fallen short of being able to produce and sustain a high rabbit population. The lesson from Penny Bend might not be an easy one to accept, and the classroom door is still wide open, but our focus has switched from habitat to predation. In certain instances, despite suitable habitat, rabbit populations may be adversely affected by predators. As the next chapter on Penny Bend begins, we plan to continue our habitat work while monitoring the rabbit population response to the exclusion and removal of predators from the area.

We may still be able to create a heaven for rabbits at Penny Bend. The bigger challenge will be to understand better the complex, and possibly changing, relationship between habitat and predators. Are our increasingly fragmented islands of prime habitat more vulnerable to predation? Are feral dogs and cats a major problem? What else is at work in our changing world?

Stay tuned, folks. We'll let you know what we learn when the next chapter is complete. ☒

Author Steve Pozzanghera is a wildlife technician in charge of small-game research at Penny Bend.



How To Get The Blues

Catching bluefish is easier if you learn their migratory patterns, the water temperature they prefer and foods they like best.

written and photographed by
Joel Arrington ©1990

When anglers and bluefish converge at Hatteras Point, the action can be spectacular (left). Aggressiveness and tenacious fighting abilities make bluefish the most popular gamefish found off North Carolina's coast.

In tackle and barber shops, little argument arises over the species most important to anglers along the shores of the western Alantic Ocean. It's bluefish, hands down.

The abundance and widespread distribution of bluefish would ensure their place at the top of the list even if their popularity did not. But because of outstanding game and table qualities, bluefish remain—in their various size categories—among the most highly sought fish of eastern America. In recent years blues have been the predominant species (by weight) harvested by marine anglers, and for good reason. They are good to eat in any size, and the small ones are a special treat. The way they take bait and artificial lures and the determined way they resist capture earns them a special place in the hearts of anglers who admire strength, energy and pluck.

Generally speaking, bluefish are easy to catch. However, anglers will have more consistent success if they take note of migratory patterns, temperature and food preferences, and other facts of the species's natural history.

Small bluefish occur in North Carolina estuarine and near-shore waters during warm weather—generally from May well into October. These fish migrate south or into deep water offshore and are replaced in the fall by large fish migrating from the north. Bluefish above 12 pounds have been a phenomenon of North Carolina cool-weather fishing since 1965, when the latest of historic long-term abundance cycles began. Previous appearances of giant bluefish occurred in 1935 and before the turn of the century. A cycle began in 1842, peaked and ended by 1879. Curiously, midsize bluefish weighing from 5 to 10 pounds have been rare in North Carolina waters, even during the big fish cycles, although fishermen encounter that size category north of here.

Fishing for what anglers call "snapper" or "tailor" bluefish begins in spring when water temperature approaches 64 degrees Fahrenheit. Small fish will tolerate water as cold as 59 degrees in fall. Bluefish weighing from just a few ounces up to 3 or 4 pounds are common north of Cape Fear from spring until early fall, with the larger fish of that size category more abundant in late summer and fall. Fishing for this class of bluefish is very different from fishing for the big "choppers," as anglers have come to call giant bluefish.

Because small blues feed largely on minnows like silversides, lures that imitate them serve the angler well. Pieces of cut fish, particularly strips, also catch lots of little bluefish. Their sharp teeth make metal lures practical, for even small bluefish will soon destroy soft wooden and most plastic lures. Those teeth will also

How To Get The Blues

damage light-wire hooks, so savvy anglers replace trebles with stout singles, which are also easier to remove from fish. Some spoons and artificial squids have the density necessary for long casts in windy conditions. When I used to fish frequently for king mackerel with live bluefish, we caught our bait most often by casting a ⅝-ounce chrome Krocodile spoon along a jetty and into white water of cape shoals. Clashing currents near inlets trap schools of baitfish that attract snapper blues. Wherever you find white water on inlet bars or swift, clashing currents along jetties, particularly on the falling tide, you are likely to find bluefish feeding on bait, with sea birds hovering over them for scraps. Often you can stand on inlet shores and reach feeding fish.

In a boat, anglers have an advantage. You could troll a flashy spoon, but to do so requires a lead weighing from 2 to 6 or 8 ounces, which takes some of the pleasure out of catching these small, scrappy fish. Their size begs for a lighter tackle. Rods should be about 6 to 7 feet long and fitted with a small-to-medium spin reel. Cast a ½-ounce to ¾-ounce lure like the Krocodile or a small Hopkins on 10-pound test line with a wire leader maybe 4 inches long. A small swivel at the leader/line connection will help prevent line twist. Use a black swivel, which is less likely to attract a strike that will cut your line. Even so, schooling blues will occasionally hit the wake where your swivel slices through the water surface.

Cape shoals are another gathering spot for bluefish. Shoals may be fished from shore or from boats with bait or lures. When winds have been calm for a few days and water is relatively clear, lures are more effective. Frequently, bluefish schools move onto bars lying just off the beach. Long casts with substantial rods may be required to reach them. Here, an 8- to 10-foot surf rod with a medium tip should be paired with a medium reel having capacity for at least 250 yards of 12-pound test line. A somewhat heavier version of this rod-and-reel combination will be a good choice for large bluefish when they arrive.

Large bluefish like water with a surface temperature of 55 to 68 degrees F, but they have been caught in water measuring as low as 48 and as high as 86 degrees. They migrate into North Carolina's inshore waters generally in late October, then move offshore sometime in December. Appearances over the winter are even more unpredictable, but they have occurred in January and February. Schools more often approach Outer Banks beaches in early spring, when water reaches at least 55 degrees F. Most of them are gone by the end of May.

In recent years, big blues have been fairly consistent in their appearances at Oregon Inlet in late March and April, almost to the exclusion of any other location. In 1988 the run was particularly strong, with daily appearances for over two weeks. Last spring was not nearly as productive, however, and anyone who predicts future bluefish appearances is treading on thin ice, indeed.

For 25 years fall fishing has been much more dependable than fishing in the spring. Last year was a little different from the recent past. Cool weather arrived late and high winds kept the Outer Banks surf stirred up for much of the fall so that fish did not concentrate in dense schools and blitz the beaches as they have some years. Fishing was less spectacular but widely distributed, with considerable success accruing to anglers who set up on the beach somewhere between Corolla, near the Virginia border, and Hatteras Inlet and patiently soaked bait. A few short-lived blitzes occurred, but usually about an hour after I left the beach. While I live less than 10 miles from the ocean, I drove more than 700 miles last November checking on the giant bluefish and never did see one caught. Yet hundreds of anglers were lucky and enjoyed, if not a great season, at least a good day or two.

So while I may be a poor source of advice on strategy for locating big blues, I can offer information on what has happened in the past. November and December have been the best months. Recent falls have seen a shift north in the center of abundance. Once catches offshore of Cape Fear were considerable, although I never heard of big blues coming to the beaches near Southport or Carolina Beach. Cape Lookout shoals have produced good fishing in years past, but lately more fish have been caught north of Cape Hatteras. That could change, and I wouldn't be surprised if it did.

Big blues like big baits. They follow schools of migrating menhaden that might run 6 inches or more in length in the fall, for example. When researchers fed minnows to fish in a tank until they were stuffed, the bluefish ignored additional minnows of the same size. However, when the scientists introduced larger baitfish, the blues attacked them. Nature gave bluefish formidable teeth and great jaw strength. They easily cut up large bait and even attack large prey species like speckled trout. Every year blues run trout up on Outer Banks beaches, so that anglers can pick them up like seashells. Some theorists believe giant blues survive by eating some of their competition.

Anglers take advantage of this aggressiveness, throwing large artificial lures, but plugs must be durable. The number 4 Hopkins is a standard metal lure, as is the 3-ounce Krocodile. Gibbs poppers are well-made wooden plugs that will stand up to quite a few fish before they must be discarded. Tackle shops along the coast in areas where big blues are caught carry lures of more local origin that cast well and catch fish. Density is what you need for long casts in windy conditions.

Replace treble hooks with large singles. Plentiful as they have been, excess bluefish ought to be released, and they are not likely to survive if you've squashed them to the beach with your foot and twisted on a treble hook with pliers for five minutes. Single hooks are much easier to remove and they stand up to multiple fish as well. Stainless steel hooks will carry over from one season to the next. Anglers are generally doing a better job of releasing blues, but too many fish are injured internally when we pin them to the ground or deck. A sharpened conservation ethic requires care in releasing fish.

Since the spring of 1990, a joint Atlantic Marine Fisheries Commission/federal management plan has limited anglers to 10 bluefish per day caught in waters lying from 3 to 200 miles offshore. States (which control inshore waters) are being asked to conform their regulations to the federal plan, but any changes will be voluntary. Should North Carolina impose a 10-fish limit, it would force changes in surf-fishing tournaments that award points to any number of bluefish caught.

The ideal rod for giant blues is not the biggest and heaviest you see in shops but a step or two down from magnum tackle more suitable for big red drum. Ten-foot rods with medium action are good, fitted with large spin reels with capacity for 300 yards or more of 15-pound test line. A few anglers will prefer revolving-spool reels, but not many. Most carry light and heavier versions for the varying conditions they might encounter. Often you must use a bigger rod than you want just to reach fish

Big bluefish follow *schools of migrating menhaden in the fall. Anglers can use concentrations of baitfish and hovering gulls to locate schools of blues.*

under birds far off the beach. Later they might be literally at your feet. On these occasions, a flyrod can be used to good effect in rare calm conditions.

Anglers determined to catch blues should be prepared to fish bait. Most of the time, sea conditions are not suitable for lures. Fish can be scattered, rather than in schools, so that bait on the bottom will be much more effective than lures often for days or weeks at a time. Tackle shops usually carry fresh mullet until near the tail of the season; then you might find frozen mullet, a very poor substitute. Anglers handy with seines and cast nets might catch their own bait from creeks and ditches. If you can get a little bait and then fish it on light-wire hooks, you might catch a spot, small bluefish or other oily fish that will serve you well as bait.

Standard terminal tackle for bluefish is what on the Outer Banks is called a "fireball" rig. It features a bright fluorescent float on a single dropper ahead of an approximately 8/0 single hook. The float keeps the bait off the bottom and moving. You attach a lead pyramid to a clip at the terminal end. Carry pyramids weighing from 3 to 6 ounces. If you can't hold bottom with 6 ounces you will probably not miss many bluefish by waiting until conditions calm down.

Water temperature, among other factors, can vary widely in the course of a single day. In the fall, for example, receding tides will be much colder than the ocean. Temperature on low tide (mostly sound water) can be 20 degrees less than a measurement at the same location on high tide (mostly ocean water). Bluefish move about locally, I believe, primarily as a function of water temperature and availability of bait, which also seeks to optimize its comfort by moving with masses of water in its preferred temperature range.

Satellite telemetry helped scientists describe how warm-water and cold-water eddies form near the Gulf Stream, sometimes encapsulating schools of fish. Dr. Boori Olla, a fish behaviorist, told me about a school of bluefish caught up in an eddy with numbers of blue sharks. The bluefish would not break through the eddy's thermal walls to escape massacre. Such eddies may affect the movements of bluefish from offshore wintering locations to nearshore waters. Anglers can check ocean temperatures, however, by calling piers, at least until they close in late November.

Bluefish anglers are constantly in doubt. Should we drive the beach or wait for fish where they have frequently and lately appeared? Chatting up clerks at coastal tackle shops sometimes helps locate blues, but if their advice fails to pan out, don't be too hard on them. For the most part, they pass on intelligence brought in by customers, some of which might be overstated, misinterpreted or wrong. There is no way shops can check out every fishing report for authenticity. Some clerks will pass on information only from people they know they can depend on. Others trust everyone. Fishing reports, more than most other types of information, have a way of becoming disjointed from reality. The revelation that fishermen will occasionally take liberty with the truth, however, will not be earthshaking news. ⊠

SOARING with Aerial Hunters

Falconry's partnership between raptor and hunter still yields the excitement that thrilled ancient hunters.

written by William Halstead
photographed by Ken Taylor

I first fell in love with the peregrine falcon at Pea Island National Wildlife Refuge. I was very young and had avidly read accounts of these birds by biologists and falconers. But nothing prepared me for the noiseless black sickle that materialized from the fog over North Pond and snatched a plover from the startled flock south of my observation tower. In an instant it had disappeared into the fog with its meal. Just as quickly, the plovers filled the void left behind, but for me a window in time had opened and through it I stepped into the world of falconry.

In its most basic form, falconry is a form of hunting—it's the taking of wild quarry by a bird of prey that has learned to hunt cooperatively with human beings. Historical evidence indicates falconry developed about 4,000 years ago on the plains of central Asia and subsequently spread by means of invasion, migration and trade to Korea, China, India and the Middle East. At the end of the Crusades, European nobility brought Saracen falconers home with them so that they could continue to watch them fly falcons.

Over time, three basic styles of falconry evolved: Japanese, Arab and European. In Japan, primarily hawks and hawk eagles were taken from their nests, retained in captivity throughout their lifetimes, and flown at large quarry such as hares and red-crowned cranes. On the Arabian Peninsula, falconers for thousands of years used immature saker falcons trapped during their fall migration by nomadic tribesmen. They were trained quickly and flown at migratory quarry through the winter. In the spring, once their quarry had left, the falcons were released to return north, where they could breed. European falconers commonly used both falcons and hawks that were taken as they were available, either from the nest or on migration. In Europe and Japan, falconers kept their birds as long as possible.

In the United States falconry tends to combine facets of each of these styles tailored to suit local conditions, so that American falconers enjoy what is probably the most exciting falconry in the world, and one that has the least impact on the birds or their prey. North Carolina falconers use two different types of birds of prey for their sport: hawks and falcons. The hawks are divided into the buteos (such as our red-tail hawk), the parabuteo (or the Harris hawk) and the accipiters or true woods hawks (the sharpshinned, Cooper's and goshawk). The falcons include the gyrfalcon, peregrine, prairie, merlin and kestrel as well as hybrids produced from these species in captivity.

Falconry became regulated at the federal and state levels during the 1970s out of a desire to limit its impact by standardizing minimal requirements. Most of the impetus for the regulations came from falconers themselves, who, as the sport grew more popular, wanted to ensure that new falcon-

*A **red-tailed hawk** flies to a falconer's gloved hand. Falconry has increased in popularity over the last decade. Today, about 50 falconers statewide work with peregrine falcons and a variety of hawks, including the red-tail, the Harris hawk and Cooper's hawk.*

ers knew something about the birds and their needs. If you want to practice falconry in North Carolina today you must obtain a falconry permit, an annual falconry license and a state hunting license. The N.C. Wildlife Resources Commission issues three classes of permits, reflecting the degree of experience held by the applicant: an apprentice class, a general class and a master class. Since regulation of falconry in North Carolina began in 1979, the number of falconers has grown from only four to about 50. Recently, falconers have organized the North Carolina Falconer's Guild to benefit falconry, raptors and their prey, as well as to promote conservation of all our natural resources.

Most birds are obtained by trapping, yet only a master falconer, for example, can take a young hawk from the nest, the established way in which falconers acquire their hawks. On the other hand, since peregrine falcons are an endangered species, protected by the Endangered Species Act, falconers obtain them only through captive-breeding programs.

The hunting techniques employed by falconers are directly adapted from the strategies evolved by the raptors to capture their natural prey. For example, hawks tend to hunt from perches in trees or they make low-altitude, high-speed runs over areas likely to produce quarry. Thus hawks are commonly encouraged to follow the falconer from tree to tree as he attempts to flush prey. Although falcons also make these strafing runs, they are classically characterized as high-altitude hunters. At great heights falcons are better able to spot their quarry and dive at great speed to strike aerial prey.

The bird most commonly used by falconers in North Carolina to hunt squirrels and rabbits is our most common large buteo, the red-tail hawk. Both are challenges for the hawk and exciting for the falconer to watch. Says Mark Hord, a falconer who uses red-tails, "Cottontails change direction so frequently and find their burrows so often that it's easy to see why wild hawks often 'settle' for mice and rats as a regular diet." Still, to see a hawk crash into brier brambles or dive under snow-covered Fraser firs to snare a fleeing rabbit stirs up a lot of respect for the red-tail's zest for the hunt.

Another popular hawk is the Harris hawk, native to the southwestern states and readily bred in captivity due to its highly social nature. Chuck Bowyer, a falconer from Laurinburg, has had success in the field with this hawk. Because the Harris is social and well-mannered, many falconers fly two at the same time to exploit the group hunting behavior often seen in the wild. This results in an exciting flight with a high success rate.

***Holding aloft** a Harris hawk, this falconer waits while others attempt to flush prey for a hunt. Hunting techniques vary from hawk to hawk. Many hawks are released first and hunt from perches high in trees while their human partners below scare up their prey.*

The Cooper's hawk is the most commonly flown accipiter in North Carolina. In the wild, it is a shy, nervous bird capable of acts of bravado, traits that endear it to its partners. Bob Pendergrass of Statesville has had experience with this species and offers this account:

"Cooper's hawks are hard to maintain, often stubborn, and sometimes vent their frustrations on their falconer. In the excitement of the chase, however, they stand alone with their determination and bursts of speed. One hunt with my first Cooper's, Mr. C, stands out in memory. Mr. C was only about six months old but was beginning to understand his purpose in life. On previous flights, he had amazed me by reacting to sounds and leaving the fist prior to the flush. This had served us well in his early success with English sparrows, but he hadn't quite been able to overtake the few quail that we had seen.

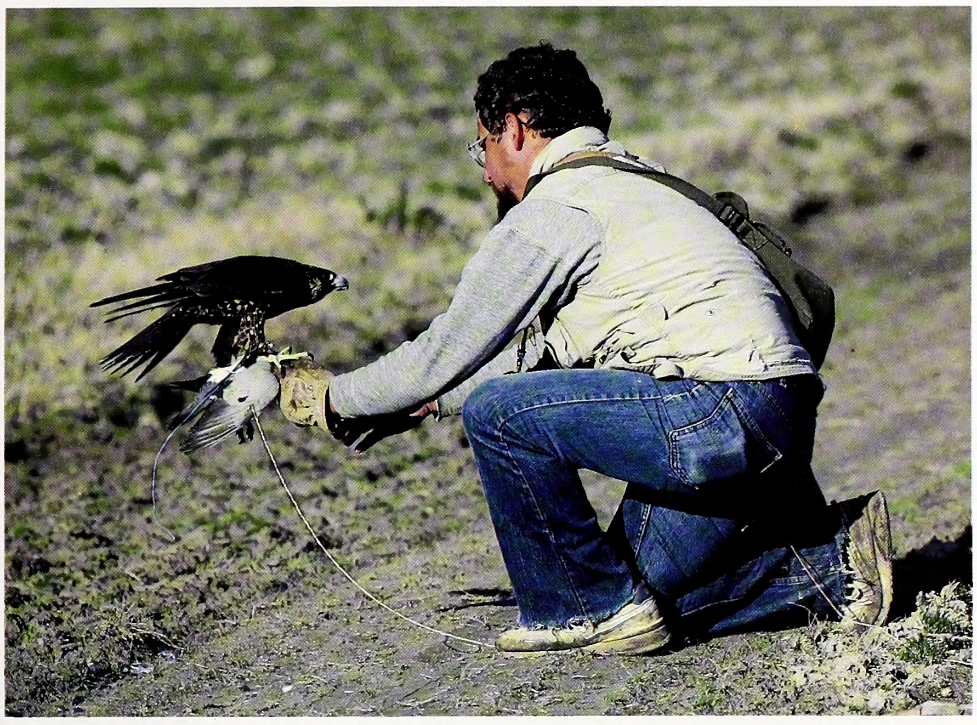
"On one occasion, we walked a road that bordered our sparrow field and having no luck, I decided to leave. As I stepped off the road a covey of about eight quail flushed and Mr. C pursued them. In what seemed to be slow motion, Mr. C closed in

on the last quail, overtook it, shot out one foot, and brought it to the ground. The quail, like Mr. C, was young and inexperienced. As Mr. C fed on his quarry, I stood silently, privileged to have participated in this struggle. The death of this quail taught Mr. C a lesson that would assist his survival when he was free. Three months later Mr. C decided not to return. I wish him the best as this is also part of falconry."

My own experience with falconry has been primarily with peregrine falcons. North Carolina is fortunate enough to host several species of falcons. In fact, the peregrine and kestrel breed here, merlins and tundra peregrines are common migrants along our coast, and during severe winters an occasional gyrfalcon is seen. I've had the great fortune to fly an immature female peregrine named Shug. She is fourth-generation captive bred, a product of the technology developed by falconers to save the peregrine falcon from extinction after its decline due to heavy pesticide use in the 25 years after World War II.

As I enter the mews or facility where she is housed, Shug "chups" a vocal greeting and settles out her feathers as she steps to my gloved fist. Just as comfortably she hops to the perch in my car for the ride to our flying field. Unlike most falcons she enjoys the ride and does not require wearing a hood to prevent her from being frightened by strange sights. At the field I hood her to prevent premature attempts to chase small birds and attach the telemetry transmitter that I will use to locate her if we are separated. With these preparations completed, I remove the leash and jesses (short leather straps) from her legs. Before removing the hood I make the low whistle that she associates with the beginning of a flight and her feet clench the glove. Her wings are half opened as I slip the hood off and in an instant she is away, sculling with her wingtips in the manner characteristic of a hunting falcon.

Shug is a powerful bird and climbs several hundred feet to begin half mile outruns seeking a thermal. Soon she is spirited upward by the thermal and I must use binoculars to keep track of her as she plays in the clouds. For half an hour I watch her, then she disappears even from the binoculars' view and I begin to work the harvested cornfield seeking to flush some prey. A feral pigeon is startled and circles the field, having forgotten the falcon's presence. After several seconds I hear Shug as she cuts the air, sounding for all the world like a whiffle ball with afterburner assistance. She is a tiny brown teardrop spiraling towards the pigeon. At the last moment the pigeon sideslips a few inches and Shug's momentum is too great to correct her aim. She careens wildly and then brakes to project herself upward 300 feet, exhausting the remaining momentum. Quickly she rolls and pumps with all her might to close from the opposite direction. The prey is surprised and reacts too late. Shug's strike kills the pigeon in an instant.



***The author secures** his peregrine falcon, Shug, after a kill. Peregrine falcons are an endangered species and falconers are permitted to use only specimens that have been raised in pens. Falconers' experience in raising peregrines helped in restocking the bird in the wild.*

Settling on the pigeon, she chups and bows to me as I approach to scoop her and the pigeon onto my gloved fist. That window in time has opened again. No one can own a falcon, but at least until she decides differently, we belong together.

Many different types of people become falconers, but most share several common traits: a high degree of responsibility, dedication to the welfare of the birds and a strong interest in the environment. These traits make it possible for the falconer to provide the time, resourcefulness and level of commitment neccessary to acquire the knowledge to practice falconry in a manner that makes the least impact on our natural resources.

Falconry has, over the years, continued to provide a source of information about the biology of raptors and their prey. Falconers spend an incredible number of hours in the field, in proportion to the amount of game taken, and by their very nature are passionate observers of wildlife and the environment. The decline in numbers of peregrines and Cooper's hawks were first noticed by falconers, who then lobbied for protective legislation and established a successful breeding and release program in the face of much skepticism.

Aldo Leopold, the father of wildlife biology, described falconry as the perfect field sport, with little if any impact on either the birds or their prey and rewarding the falconer with a rich awareness of the environment.

While falconry is not for everyone, all should be aware that without such a passionate involvement with wildlife and the outdoors, we won't have much of an environment to preserve. ⚀

For more information concerning falconry, contact the following organizations:

The Nongame and Endangered Wildlife Program, N.C. Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, NC 27604-1188

Kitty Marconi, Southeastern Director, North American Falconer's Association, 10646 Powell Road, Thurmont, Md., 21788

North Carolina Falconer's Guild, P.O. Box 255, Chapel Hill, NC 27514

Summer Burning, Pine Straw Raking Examined

Conference Examines Longleaf Pine Ecosystem Management

Written and Edited by Vic Venters

Pine straw raking and the effects of fire headed the list of topics discussed by over 130 participants at the second longleaf pine conference held last summer at Richmond Community College near Hamlet.

Sponsored by the Natural Heritage Program, the N.C. Nature Conservancy and the N.C. Wildlife Resources Commission, the conference assembled many of the same foresters, biologists and landowners who attended the first meeting in January 1989.

"A lot of the people at the first conference wanted more focus on management, so we designed the second conference for that purpose," explained Julie Moore, a Natural Heritage Program survey specialist. The beleaguered longleaf pine forests, rich in plant and wildlife species, have been nearly eliminated from their native range throughout the southeastern Coastal Plain.

But the longleaf remnants have been aided by recent court rulings mandating protection of the longleaf habitat of the red-cockaded woodpecker, an endangered species. The lucrative market for pine straw has also fanned interest in longleaf.

How often and when to burn longleaf pine forests were major topics of discussion among the participants. Longleaf pine is one of many southeastern plant communities that have adapted to the region's frequent fires. From the 1920s to the 1960s, however, fire-suppression policies caused many remnant longleaf pine forests to be choked by scrub oaks. Today, controlled-burning programs have been established to reduce fuel buildup and open stands.

Most foresters have traditionally burned longleaf during the winter months, when fire is considered more controllable. But several conference participants reported success in burning during the spring and summer, thought to be the time when fires often occurred naturally. Ron Meyers, a Nature Conservancy forest specialist at Tall Timbers Research Station in Tallahassee, Florida, pointed out the benefits of a growing-season burn, including its effectiveness at reducing oak growth. "If you want to maintain the ground cover and the natural species composition, you should burn your longleaf in the growing season at least once in a while," he said.

Pine straw raking was another major topic. Ironically, longleaf pine needles, raked into bales and sold for landscaping mulch, are more valuable in today's market than longleaf pine timber itself. "Richmond County is one of the few places where people will pay you for raking their yard," joked Terry Sharpe, a Wildlife Commission biologist.

Yet, some researchers have suggested that continued and long-term removal of the needle cover has serious effects on the ecosystem, perhaps reducing water in the soil, lessening tree growth, damaging groundcover, eroding soil, and disrupting burning programs.

Though the pine straw market has potential for growth, a lot of questions still remain to be answered, said Bill Gardner, an associate professor of forestry extension at N.C. State University. He pointed out the existence of a new organization, the Pine Straw Producers Association, that has begun to address some of these problems.

"This market is so immature," he said, "that there's no standard bale size yet. There are not even any grades that rate the quality of the straw."

Sharpe was pleased at the conference turnout. "It really says something good about the degree of interest in longleaf that so many people came to both conferences," he said.

—Lawrence S. Earley

Turkey Federation Offers Reward

Turkeys Protected in the Fall

Don't Shoot: *With turkey populations increasing, hunters may encounter turkeys in the woods this fall. Remember, North Carolina's turkey season is held only in the spring when bearded birds may be taken. A spring-only season allows hunters to cull surplus gobblers (males) without harming the breeding female population. The National Wild Turkey Federation in North Carolina and the N.C. Bowhunter's Association are offering a $500 reward for information leading to the arrest and conviction of anyone illegally killing a wild turkey.*

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Suburbs Replace Schweinitz's Sunflower

Sunflower Link to Carolinas' Prairie Past

Take a look at Charlotte's gleaming new office towers and sprawling suburbs. Then imagine in its stead an open, grassy prairie, teeming with buffalo, elk and vast stands of wildflowers and cane. As incongruous as it sounds, the Piedmont area around Charlotte and surrounding counties in North and South Carolina once supported this prairie ecosystem before European settlement drastically altered the landscape and suppressed the wildfires which prevented the invasion of forest.

Although the open land, the buffalo and the elk disappeared a short time after the Revolutionary War, a handful of prairie plants survive as fragile reminders of this forgotten past. In recent years, development and urbanization have taken a toll on the surviving populations of one of those plants—Schweinitz's sunflower. This sunflower is today found only in 15 locations in North and South Carolina. Schweinitz's sunflower, which can reach heights of 10 feet, grows best in the clay-loam soils around Charlotte and today survives only in areas such as road margins and power line right-of-ways where annual mowing has kept successional vegetation down, thus imitating the treeless prairie conditions of North Carolina's pre-European landscape.

Though the species is already on the state's endangered plant list, the U.S. Fish and Wildlife Service has recently proposed adding the sunflower to the federal endangered species list. The N.C. Department of Transportation has been cooperating with The N.C. Natural Heritage Program and the Fish and Wildlife Service by protecting areas that contain Schweinitz's sunflower and by not mowing during its flowering season. The largest known concentration of Schweinitz's sunflower in North Carolina is found on a farm in north Mecklenburg County. The land has been protected by an agreement between the landowner and the N.C. Nature Conservancy.

Public Gets Info Referral Service

Environmental Education Office Formed

Twenty years ago, the first Earth Day helped spur increased emphasis on the environment by government agencies. This year, Earth Day 1990 has resulted in a new state government office to spread knowledge of environmental affairs across North Carolina.

Created at the request of Gov. James G. Martin, the new Office of Environmental Education will coordinate environmental efforts across the state, said Dr. Linda Little, the new director for the office. "A real need was seen for a single place to coordinate all the different environmental education activities that go on within state government." Among the duties the office will undertake:

- Create an information and referral service, and a computerized central data base to direct the public to materials and information available from different state agencies. "We are not going to be the experts on everything, but with one call we should be able to refer you to the people who are," Little said.
- Establish a Project Tomorrow Awards Program to award schools and educators for outstanding environmental and natural resource projects.
- Develop a liaison with the Department of Public Instruction to help integrate environmental education into the school system's curricula.
- Assess the opportunity for setting up regional environmental education centers in the three areas of the state.
- Develop environmental workshops and programs.

Other priorities include translating highly technical data generated by state agencies into more "user friendly" information and developing a compendium on the ways the public can participate in the permitting process. For more information, call the Office of Environmental Education, (919) 733-0711.

Field Notes

Dove (first season)	Closes Oct. 6
Rails, Gallinules and Moorhens	Closes Nov. 9
Eastern Bow and Arrow Deer	Closes Oct. 6
Western Bow and Arrow Deer (except Yancey County)	Closes Oct. 6, Reopens Oct. 15-Nov. 17
Central Bow and Arrow Deer	Closes Nov. 3
Northwestern Bow and Arrow Deer	Closes Nov. 10
Eastern Muzzleloading Deer	Oct. 8-13
Western Muzzleloading Deer	Oct. 8-13
Eastern Gun Deer	Opens Oct. 15
Wild Boar (first season)	Oct. 15-Nov. 17
Black Bear	*See Regulations Digest*
Raccoon and Opossum	*See Regulations Digest*
Gray Squirrel	Opens Oct. 15
Fox Squirrel (only in 18 counties)	*See Regulations Digest*
Ruffed Grouse	Opens Oct. 15

Information on bag limits, either-sex hunts and other regulations may be found in the 1990-91 North Carolina Inland Fishing, Hunting & Trapping Regulations Digest. Migratory waterfowl regulations were unavailable at press time. Check with the license agents or write the N.C. Wildlife Resources Commission after Oct. 1, 1990.

The 1991 North Carolina Wildlife Calendar Is Here!

***With such artwork** as Jake Taylor's "Licking Branch" featured above, the North Carolina Wildlife Calendar is sure to sell out again this year.*

The works of Bob Timberlake, Patsy McAuley, Walt Obman, Bob Herr, Robert B. Dance, Jake Taylor, Robert C. Flowers Jr., James A. Brooks, Judy Mizell, Duane Raver and Dan Johnson are featured in the 1991 Wildlife Calendar. Order yours today by returning the form below with your check or money order to 1991 Calendar, N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

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Rare Plants and Animals, Ecosystems Listed

Natural Heritage Program Lists for Sale

Whether you're a bird-watcher, a botanist, or a concerned naturalist, the Natural Heritage Program's revised lists of natural communities, rare plants, and rare animals offer the most up-to-date indicators of North Carolina's threatened resources.

The 325-page classification of natural communities describes the various naturally occurring vegetated marine, terrestrial, palustrine and estuarine ecosystems found in North Carolina. The rare plant booklet lists the approximate number of troubled or uncommon plant species found in North Carolina and measures their threat status on a state, national and global scale. The 56-page plant list includes 582 endangered or rare species as well as an additional 370 species that are troubled or uncommon. The 25-page booklet on rare animal species lists the mammals, birds, reptiles, amphibians, fish and mollusks in trouble or uncommon in North Carolina.

Because of budget constraints, the number of copies is limited; however, copies are available from the Natural Heritage Foundation for the cost of duplication. Prices are $15 for the classification of natural communities, $4.50 for the rare plant list, and $3.50 for the rare animal list. Orders may be placed through the Natural Heritage Program, P.O. Box 27687, Raleigh, NC 27707.

Keep All Bream, Release Most Bass

Balanced Ponds Yield Bigger Fish

Although hunting season is here, farm ponds still offer excellent fishing in the early fall as waters cool down. If you're not catching the "big ones" from a farm pond you own or have access to, there are a few tips you should know for best managing your favorite pond:

Farm pond owners should realize that a pond can support a limited number of fish. "There is only a certain amount of fish food produced per surface acre in a pond," said fishery biologist Roger Jones of Graham. "The more crowded the fish are in a pond, the less food is available to each individual fish," Jones said. "That limits growth."

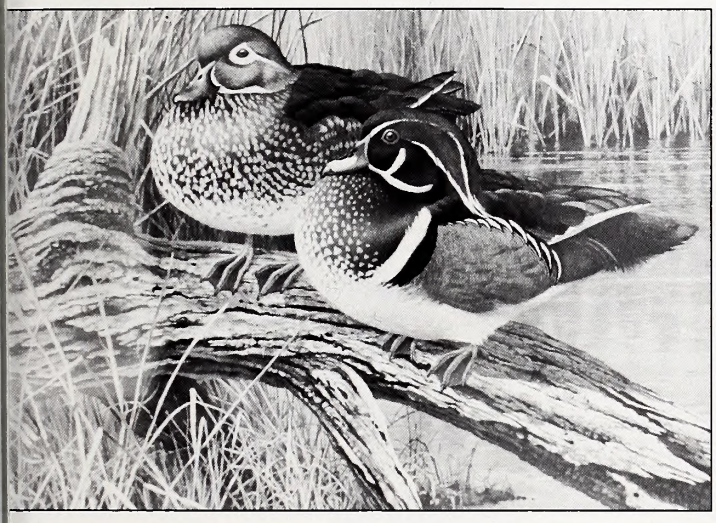
Harvesting the proper size and number of fish will improve the fishing. Farm pond owners may grow larger fish by setting a minimum length limit of 12 inches for largemouth bass. In small ponds, bass can be overharvested more easily than bream. Pond owners may harvest annually 10 to 15 pounds of bass and 80 pounds of bream for each surface acre of water in their ponds. If the pond is fertilized, twice as many fish may be removed.

Fishermen should keep all bream, regardless of their size, to help keep the population from becoming so abundant that the fish stop growing. The proper harvest of bream is a key to good pond fishing.

For a booklet on farm pond management, write the Wildlife Resources Commission, Division of Inland Fisheries, 512 N. Salisbury St., Raleigh, N.C. 27604-1188.

Fine Art, Firearms Featured

Sportsman's Show Set for New Bern



This watercolor, *"Neuse River Woodies," is the official poster of the Third Annual North Carolina Wildlife and Sportsman's Show in New Bern, October 26-28. The artist is George Shumate of Roanoke, Virginia.*

For the third year, New Bern will host the North Carolina Wildlife and Sportsman's Show from October 26 to 28. More than 50 painters, photographers, sculptors and carvers of wildlife art will participate, as will gun and knife dealers, collectors and custom craftsmen.

The show is being sponsored by the New Bern Area Chamber of Commerce. A percentage of the proceeds will benefit conservation groups.

Retriever demonstrations will be held on Saturday and Sunday by Richard A. Wolters, a recognized hunting dog trainer. Other special events include a "meet the artists" cocktail party and auction on Friday evening and a pig picking on Saturday.

For more information, write the New Bern Chamber of Commerce, P.O. Box C, New Bern, NC 28563.

More Bucks for Ducks

Commission Funds Wetland Protection

North America's troubled waterfowl populations will get some help when the N.C. Wildlife Resources Commission adds $100,000 to a fund that's attempting to save the continent's disappearing wetlands. The Wildlife Commission will allocate money to protect waterfowl breeding habitat in Canada. At the same time, the pool, administered by the National Fish and Wildlife Foundation, will allow each state to get an amount of money equal to its contributions to be spent on waterfowl projects within the state's own boundaries.

North Carolina plans to use the $100,000 the Foundation returns to the state to acquire additional wetland tracts on the Roanoke River, a focus area of the Atlantic Coast Joint Venture.

The United States and Canada have joined forces under the North American Waterfowl Management Plan to reverse the decline in certain populations of ducks and geese. The United States and Canada signed a document in 1986 to create the partnership in wildlife conservation.

The plan creates joint venture partners composed of representatives from public and private organizations. The Commission contributed $60,000 to the Foundation's pool last year and has scheduled that amount to be spent on a wetlands project in Martin County.

—Angela Dorman Hill

Cast Us A Line...

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit any correspondence. Please send to Letters Dept., *Wildlife In North Carolina*, 512 N. Salisbury St., Raleigh, N.C. 27604-1188

The Wildlife Endowment Fund Report

The Wildlife Endowment Fund is supported by the sale of lifetime licenses, lifetime subscriptions to *Wildlife in North Carolina*, and tax-deductible contributions. Only the annual interest from this fund is used for wildlife conservation, and the fund will play a key role in supporting wildlife programs in the future. Interest is earned through investments made by the State Treasurer's Office. For more information, write to the Wildlife Endowment Fund, North Carolina Wildlife Resources Commission, 512 N. Salisbury St., Raleigh, N.C. 27611.

Status on July 31, 1990

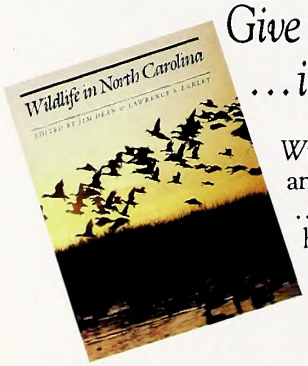
	Numbers Sold	Revenue Received
Lifetime Sportsman's License	50,065	$19,071,552.43
Lifetime Hunting License	669	191,626.82
Lifetime Fishing License	3,950	935,865.98
Lifetime Subscriptions to Wildlife in N.C.	2,067	287,192.49
Contributions	—	180,814.62
Fund Total	56,751	$20,667,052.34
Total Interest Earned		$6,024,660.84

Calendar

Oct. 6-7
Annual North Carolina Waterfowl Show sponsored by the Outer Banks Woman's Club will be held this year at Kitty Hawk Elementary School, Kitty Hawk. For more information, contact the Outer Banks Woman's Club, P.O. Box 102, Kill Devil Hills, North Carolina 27948.

Oct. 12-14
Carteret County Bottom Fishing Tournament will be held from Bailey's Marina, Atlantic Beach. Proceeds go to the Take a Kid Fishing Program and the Carteret County Sportfishing Association. For more information, contact Bailey's Marina at (919) 247-4148.

Oct. to Nov. 4
Exhibit featuring 50 years of duck stamp art will be on display at The Nature Science Center, Winston Salem. Actual stamps and prints will be on display. For more information, call (919) 767-6730.



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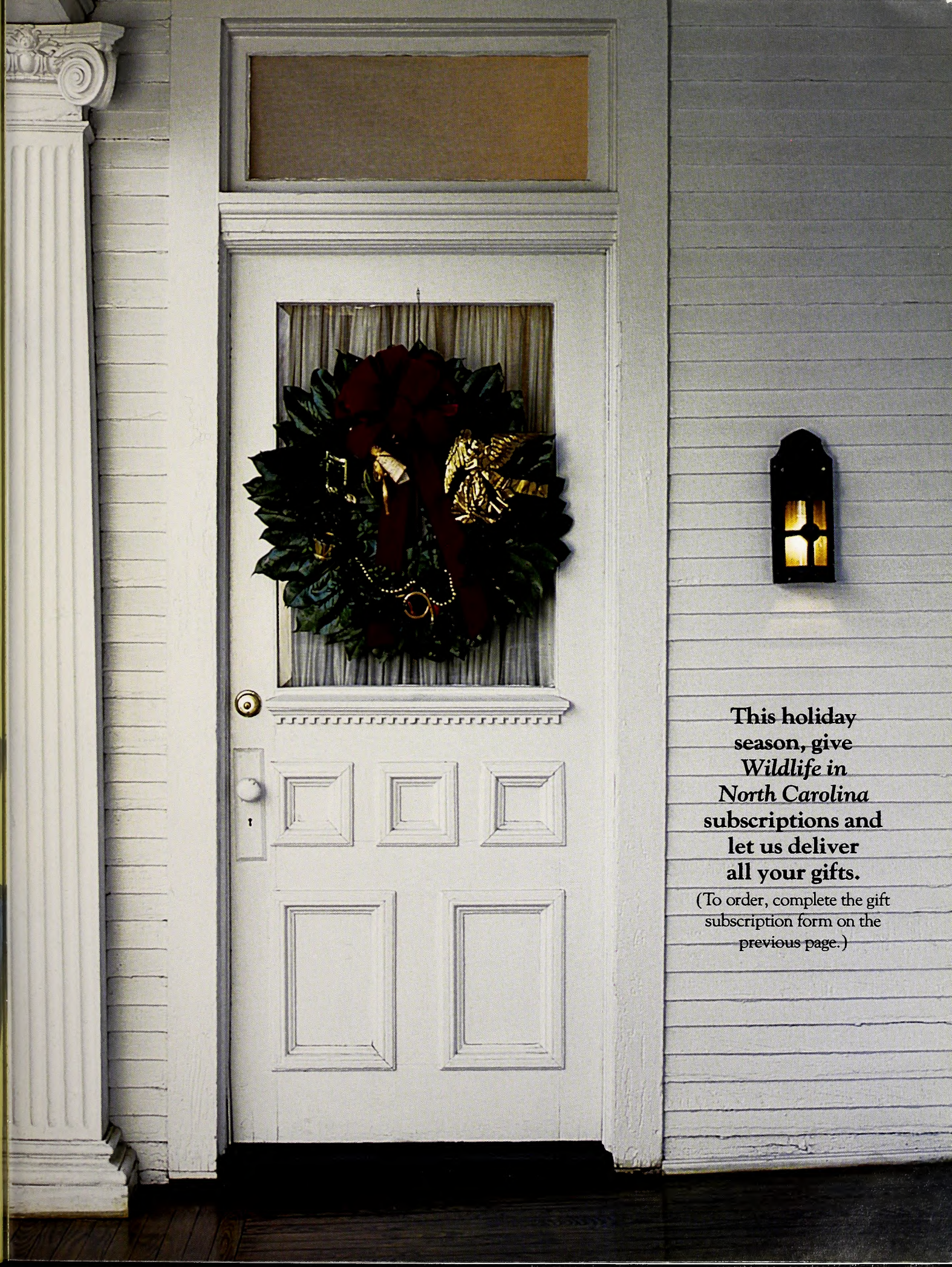

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Plantation Hunt In Paradise

by Jim Dean

The article by Eddie Nickens on bow-hunting for small game in this issue reminded me of an incident that took place on Hilton Head off the coast of South Carolina in the 1960s when development was just beginning to get a foothold on the island. As part of a clothing company's quest for publicity, newspapers throughout the Southeast were invited to send reporters and outdoor columnists to take part in an old-fashioned plantation quail hunt on the island.

Clearly, the trip was a junket, although perhaps you've noticed that editors are loathe to call it that if someone on their staff is going. As a cub reporter on my first assignment for a small-town newspaper, I was uncertain what sort of story I was supposed to sniff out. But I soon learned that the dozen or so other outdoor columnists—mostly grizzled veterans—had no doubts about their assignments. They were there to shoot quail, and woe-betide any who might prove to be poor at it.

"Anybody who doesn't get a limit of bobwhites tomorrow is a disgrace to his state, his fellow sportsmen and to the memory of Nash Buckingham,"one writer challenged us as we ate supper. A friendly rivalry was fast developing, and wagers were placed. Br'er Dean, he lay low.

LEONARD LEE RUE, III

The following morning, we showed up at the stables dressed in full red camouflage hunting outfits (courtesy of the clothing sponsor), looking for all the world like elves preparing to overthrow the North Pole. One elf, particularly, stood out. Instead of a shotgun, he carried a recurved, laminated bow. A special quiver held a couple of dozen heavily-fletched arrows. Wire loops that looked like rug beaters replaced the broadheads. He explained that they were flu-flu arrows for shooting flying game, a revelation that provoked considerable merriment.

"I think he's a little bit flu-flu himself," said my companion, raising an eyebrow as we boarded one of the mule-drawn wagons that would carry us into the fields.

Except for one hotel in a small complex, Hilton Head 20 years ago still wore its antebellum skirt. Handsome maritime forests were relieved only by vast fields and hedgerows. It was lovely, classic bird-hunting cover, and once the wagons had gone their separate ways, it was pleasurable to be towed into history by a flatulent mule. In front of us, two pointers ran the edges of the fields and the dense hedgerows, occasionally pausing to take hand signals from their handler

I was thinking how many years it had been since I ha ridden in a wagon hauling peanut stacks through Northampto County fields behind an equally musical hayburner when on of the dogs wheeled into a solid point that was instantl honored by its running mate.

"There they are, Cap'n," said our driver. He stopped th wagon well behind the dogs, and we quickly walked int the middle of a covey of 25 birds that blew out of th hedgerow like balls of fire from a Roman candle. W didn't touch a feather. "You'll get 'en next time," the driver said reassuringly The dogs looked unconvinced.

It was like that all afternoon. Thos wild-bird coveys were huge, and ther were so many of them we never bothere hunting the singles. Not that it would hav mattered. Despite superb dogwork ou shooting was abysmal, yet our hosts wer so gracious that they began to construc increasingly elaborate excuses for u anytime we seemed at a loss to explai a missed shot.

As we headed back towards the stable in late afternoon, neither of us had kille a quail, and the prospect of facing ou hotshot compadres began to loon ominously. Ahead of us, a wagon ha stopped along a brushy ditch, and two dogs were locked o point. A single elf emerged from the wagon. It was the archer He had no companion hunter because no one would go wit him. As we drove up, he nocked a flu-flu and strode int the brush. A single bobwhite soared straight up and wheele downwind. In a flowing motion, the archer swung to follo the bird. The white fletching became a blur that faltered i mid-air, and both bird and arrow fell.

It was a surprisingly solemn group that stood around th wagons at the stables. Perhaps it was the reflection from re suits in the sunset, but faces seemed abnormally flushed. M partner and I were not, as we had feared, the only beate warriors. Indeed, only a handful of bobwhites would no be whistling to rejoin countless scattered coveys that evening

From all this, I suppose I learned never to discount a flu flu, but that's only part of the memory that lingers. No that Hilton Head and most of the other sea islands fro Baldhead to Florida have been developed, it's clear that will never again see them as they were. Sadly, I am able t say that about more and more places these days.

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *A male bobwhite quail takes a moment to rest in the boughs of a pine. Photograph by Lloyd B. Hill.*

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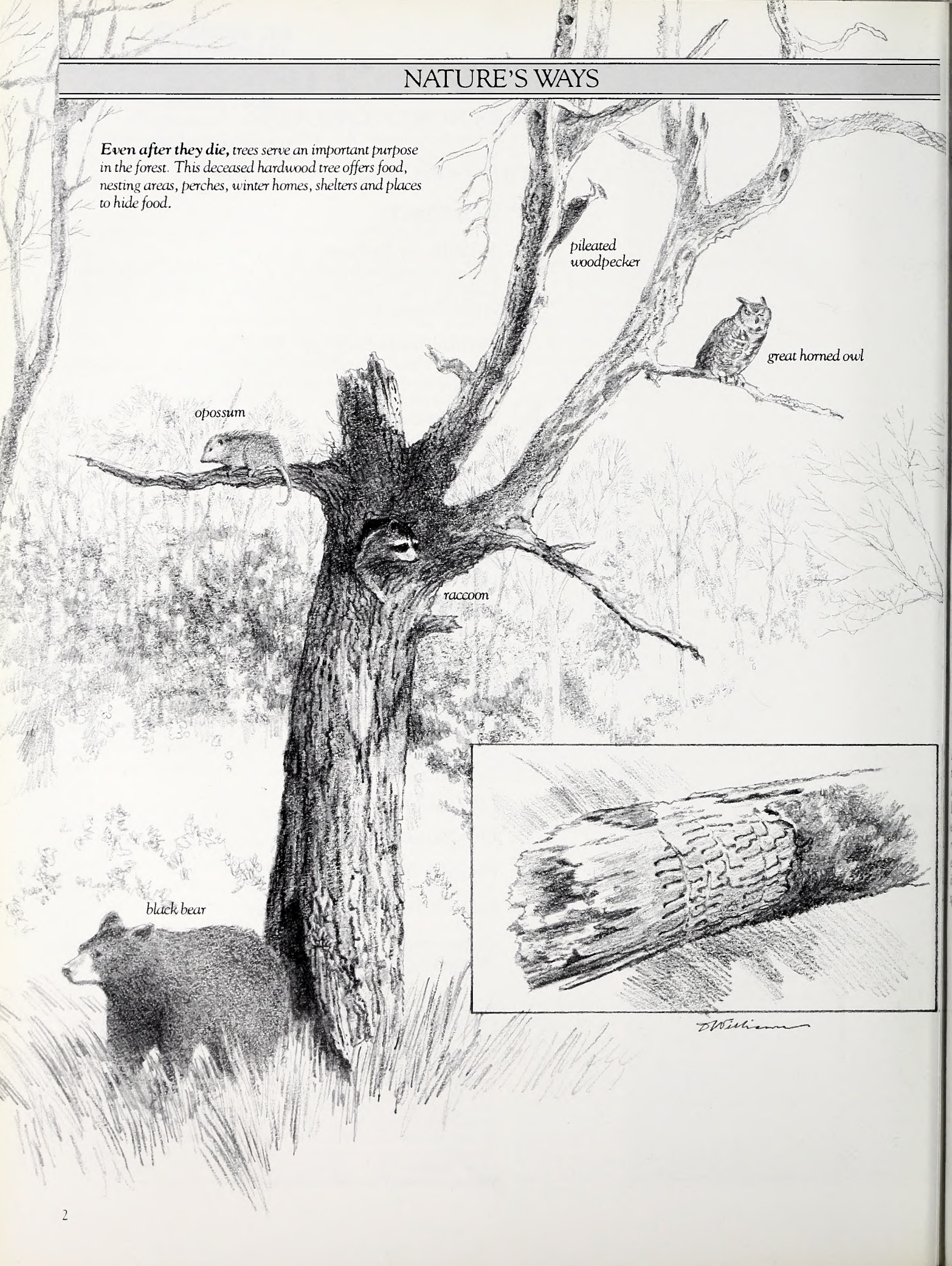
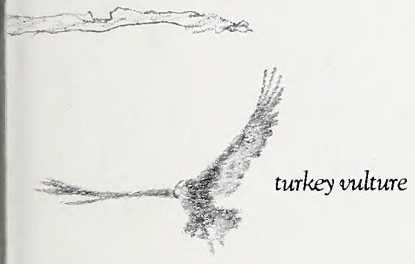
Even after they die, *trees serve an important purpose in the forest. This deceased hardwood tree offers food, nesting areas, perches, winter homes, shelters and places to hide food.*





turkey vulture

Woodsman, Spare That Tree!

written by Lawrence S. Earley/illustrated by David Williams

Once tall and massive, one of the noblest trees of the forest, the oak died 15 years ago when it was 178 years old. Yet the old tree still stands, though altered predictably by time and the elements. Many years ago lightning shattered its topmost portion, giving it a gaunt and jagged appearance, and many limbs have fallen off and others are just rough snags.

But strangely the rotting tree may be more important to wildlife now than it was when it was still alive. For a surprising number of mammals, birds and insects, the dead oak offers food, nesting areas, winter homes, shelters, places to hide food, and perches. In the United States, 49 mammal species and 85 bird species are known to use dead tree condominiums.

Cavities are one reason why the tree is so populous. In this oak tree, heart rot set in long before it died and now it's practically hollow. One year, a black bear found a rotten opening on the side of the tree and denned inside for the winter. During another season, bobcats used this ground cavity as a daytime shelter after their nocturnal hunts.

Other cavities formed as a natural part of the tree's aging process. After a branch fell off at the trunk the wood rotted, and now there's a large hole. A raccoon mother inspected it, found it to her liking and delivered her four young in it one spring. After they were old enough to accompany her on her nightly rounds, she led them headfirst down the tree, and then back up again as morning neared. Another year, an opossum used the tree to nest its young, and one winter a gangly troop of a half dozen squirrels denned there during the cold weather.

Not all cavities in the dead tree are natural. A pileated woodpecker hammers at the dead wood, excavating a nesting site for its little ones. Flickers work at other cavities until the tree carcass looks a bit like swiss cheese. Other animals can use these cavities: flying squirrels, screech owls. A tiny screech owl liked the enlargements the squirrels made so much that she cached her food there and later laid her eggs there.

The fragments of dead branches also serve wildlife well. A great horned owl settles on one as a hunting perch at night, scanning the forest floor with its large eyes and listening to the movements below. After swooping from the perch to grab a vole or mouse in its talons, it returns to the limb to eat it.

Under the loose bark, large numbers of insects live. Bark beetles attack the dead wood, creating rune-like markings on the outside. Ambrosia beetles penetrate deeply and the larvae of long-horned beetles also bore into the tree and overwinter inside. Attracted to this rich bounty of insect life, downy and hairy woodpeckers probe the soft, rotting wood with their bills, and nuthatches climb upside down looking for insects that the woodpeckers missed.

The presence of dead trees is one reason why natural forests are so much richer for wildlife than managed forests planted with a single tree species and harvested long before the trees age and die. In planned forests, managers routinely remove trees after they die, not wanting to waste the wood, and wildlife is deprived of the important services of dead trees and rotting logs.

While the oak tree lived, it fed countless animals with its life-giving acorns, but in death it still serves a noble purpose.

***Bark beetles leave** their markings on the wood of dead trees and fallen logs. Adult females create main tunnels and lay their eggs along its length. When the eggs hatch, the larvae create other tunnels at nearly right angles to the main egg-laying tunnel. After overwintering in their tunnels, they pupate in the spring and emerge as adults.*

LLOYD B. HILL

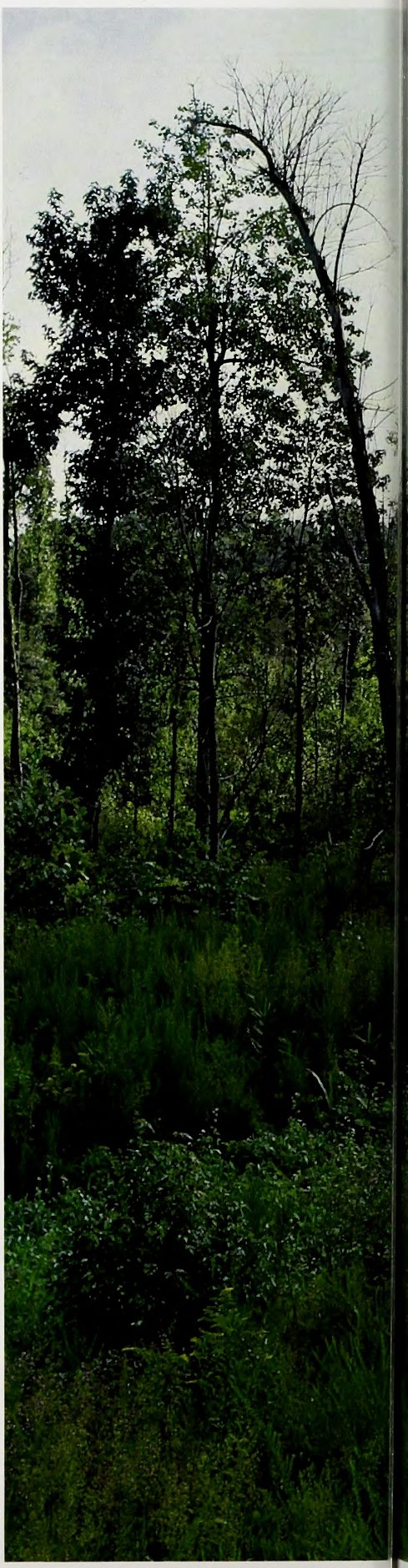
WILDLIFE ON THE FARM

Small-game populations are down, and not all the reasons are known, yet the situation is far from hopeless if you're a landowner. There's lots of quail and rabbits on these demonstration farms.

by Terry Sharpe

As I flew home from a farm wildlife conference in Missouri recently, most of my fellow passengers read, snoozed or simply sat with a glazed look in their eyes. In contrast, my attention was focused out the window as the plane passed over the foothills and northern Piedmont of North Carolina. Between the wispy clouds, a patchwork of woodlands, farmland and small towns spread beneath me. It was quite a contrast from the uniform square sections of farmland that had passed beneath only an hour earlier as we crossed the intensively farmed Midwestern landscape. From 35,000 feet, North Carolina's dark, green mature pine and hardwood forests and lighter pastures and fields stretched toward the horizon. I was seeing familiar territory, but from a unique perspective.

Later, as I drove home from the airport I had a closer view of the land I had just flown over, and it looked quite different. I drove past

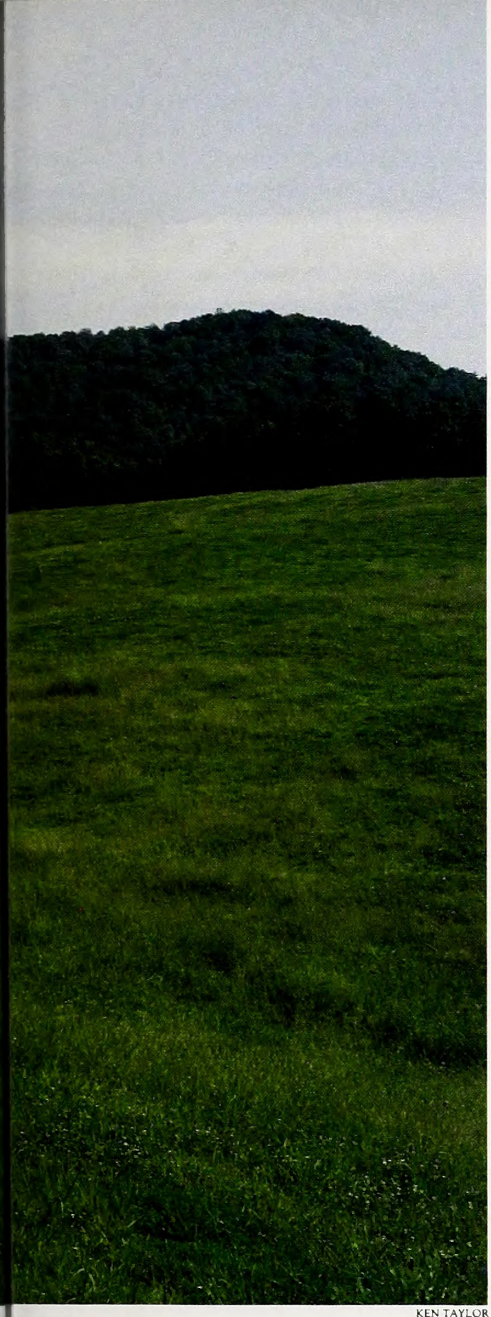


KEN TAYLOR

Improving cover *is one way to help improve populations of rabbits, quail and other small game. This Wilson County farm, one of eight wildlife demonstration farms in the program, has a strip of wildlife food in the middle of denser cover where it can be readily, and more safely, used by small game. Such practices encourage small game, yet do not disturb normal farming activities.*

On E.J. Whitmire's *Cherokee County farm, a pasture is augmented by strips of heavy cover along the edges of adjacent woods, and an "island" of thick cover in the middle. Whitmire (right) has incorporated many wildlife-enhancing features into his farm, including this pond with an erosion-control border that provides water and diversity for many wildlife species, and also contains fish "this long."*

KEN TAYLOR



KEN TAYLOR

fields of tobacco, corn and soybeans in orderly rows of cropland, pest free, abutting abruptly against mature woodlands. There were also pastures — fescue pastures. I had heard a lot about fescue during the past two days — it's a grass that forms a dense mat of sod that chokes out competing weeds and native grasses, providing no overhead cover for small game, and often generating toxins to protect itself from grazing animals.

I drove on, evaluating the differing woodlots. Younger forests consisted mostly of close, uniform rows of a single species, loblolly pine. Poor wildlife habitat, for the most part. The older stands had more variety — oak, poplar and sweetgum — but still had little undergrowth. The habitat continued to dwindle as a row of houses with fescue lawns flashed by. A house cat roamed one yard, and I knew we could mark its territory off-limits for quail and rabbits.

It was obvious that the large-scale diversity that had seemed so apparent from the air was not matched at ground level. Up close, crop fields and pastures were dominated by one species of plant, extensive stretches of woodlands provided no cover at ground level and houses with mowed yards provided little cover. It was a depressing panorama for anyone who loves small game, but one I have become painfully aware of as the small-game project leader for the N.C. Wildlife Resources Commission.

Unfortunately, the economic system that has allowed our society to flourish has spelled hard times for some wildlife species, especially small game like quail and rabbits, and opened up nearly unlimited opportunities for others, especially big game like deer. Wildlife managers are now challenged to provide for wildlife species like small game whose lifetime needs must be supplied by a diverse plant community on a few acres — and that's no small feat when prime plots are increasingly smaller and more scattered. Yet, at the same time, we are challenged to control populations of those species like deer that can take advantage of large-scale agriculture or forestry operations.

While farm wildlife populations of small game have continued to decline, there is a glimmer of hope. More landowners are becoming naturalists and land managers, interested in more than profit. Indeed, the benefits these individuals enjoy are often not economic, yet they gladly invest time, equipment and money into projects that yield less tangible benefits, ranging from an afternoon stroll to view wildlife and wildflowers to following a bird dog or pack of beagles on a crisp winter day. I would like to think that more and more landowners will follow such examples because it is becoming increasingly evident that the future of small game, at least, may lie in their hands.

It was a humid late summer morning when Lamar Myers, a Davidson County landowner, and I turned off the pavement and into the drive leading to his 30-acre farm. I made mental notes as we drove: vegetable crops separated by weed strips, hedgerows of blackberry and bicolor lespedeza along terraces and brushy edges extending out from the woods. It was definitely not a typical field situation. My host explained that he'd begun improving wildlife habitat on his small farm 14 years ago but had become more serious about it during the past eight years as he began having problems locating a good place to hunt. After a tour of the farm, we sat in the shade of an oak and discussed the pros and cons of maintaining the patchwork of cropland, weeds, brush and woodland on his farm.

"Each fall, my efforts produce plenty of rabbits to train my beagles and provide a couple of hunts for my son and friends each winter," said Myers. "I also have enough quail to keep my bird dog in shape, though he is so familiar with the area that he often cheats and only hunts the places where the birds normally hang out.

"With modern farming techniques, you can't devote many areas to wildlife, but landowners who complain of wildlife shortages are overlooking opportunities," he explained. "Landowners can implement some practices with a minimum of effort. Examples are leaving field edges in weeds and some weed fields unmowed during the winter months, or allowing blackberries to gain a foothold on terrace rows."

Over the past dozen years, the value of those efforts to Myers's wildlife is increasing as urban sprawl eats away at his traditional Piedmont hunting grounds. "I often travel to rabbit hunt with friends," he said, "but it's comforting to know that there's plenty of game on my property, and I don't have to worry about finding a place to hunt."

Landowners like Lamar Myers are making an important contribution, one the N.C. Wildlife Resources Commission recognizes. A goal of the agency's small-game program is to encourage others to consider wildlife in their land-management decisions and to promote responsible long-term management of land for multiple benefits.

One project underway since 1985 involves working with selected landowners in each region of the state to develop and publicize management efforts on a series of wildlife demonstration farms. The Wildlife Commission entered into a cooperative agreement with the N.C. Wildlife Federation, N.C. Agricultural Extension Service, N.C. Forest Service and Soil Conservation Service to work with the farm owners to develop wildlife management plans. Eight participating landowners were selected for their interest in wildlife, their willingness to assist with farm tours and news events, and because their operations are typical of what other rural North Carolinians have to work with. Primary land uses on the selected farms include growing peanuts, soybeans and tobacco in the Coastal Plain; forest products and row crops in the Piedmont; and Christmas trees, hay, forest products and cattle in the mountains. Management techniques were developed cooperatively by agency personnel and the landowners to yield recommendations that would mesh wildlife objectives with overall farm plans.

A recent visit with wildlife biologist Ken Knight to the adjoining farms of Gary Rorie and Al Griffin in Anson County provides an insight into the types of landowners who are participating in the program and the practices typically being used on the demonstration farms.

As we headed south from Wadesboro and

KEN TAYLOR

***A strip of brush** has been left between a corn crop and the woods on this McDowell County wildlife demonstration farm to provide food and cover for small game like bobwhite quail (top, opposite page). Leaving the corn stubble in the field over the winter can add both food and cover for small game.*

neared the White Store community, a few puffs of white smoke guided us in the right direction. The previous night the two neighbors had teamed up to conduct a prescribed burn on a portion of Griffin's thinned pine woodlands.

Rorie and Griffin were very happy to discuss their views on wildlife and the status of wildlife populations on their farms. Fierce but good-natured competition and neighborly cooperation sums up their relationship. Though they usually disagree on what's best, both men were brought up in rural Anson County and have developed a lifelong appreciation for wildlife and a love for their land.

"You won't see my farm on the cover of the *Progressive Farmer*," says Rorie, referring to the brushy fencerows and weedy field edges the two landowners are proud to show off. But beauty is in the eye of the beholder, and though some may think the weeds and briers that support healthy wildlife populations are unkempt, most serious hunters break into a sweat when they see the farms.

Rorie and Griffin are experimenters anxious to try new ideas. Ken asked them to tell me about some of the latest projects they have tried.

"I have owl boxes, automobile tire squirrel boxes and plantings of sawtooth oak," Rorie said. Not to be outdone, Griffin added that on his farm he has "fruit trees for wildlife use only, chufa plots for turkeys, salt licks and two stocked ⅛th-acre fish ponds."

Though eager to experiment, these farmers are well versed in the basics of wildlife management. "Food and cover are the essentials for any wildlife species to survive," notes Griffin. Later in the day as we traveled by four-wheeler around the farms, Ken and I saw ample evidence that these landowners know the basics and work hard to apply them. There were no mowed entrances, disked row crop fields and closed-canopy pine stands so commonly seen elsewhere. Instead, we saw weeds and briers along woodland edges, crop stubble in agricultural fields with patches of standing crops along edges and pine stands that were pre-commercially thinned to maintain a weedy understory.

The appearance of the farms has caused problems in the past, not from finicky neighbors but from unethical hunters who recognized the good game habitat and used it without permission. This problem eased, however, after the land was posted, hedgerows were added to screen openings and all access roads were gated.

These and other demonstration farms have served to illustrate to landowners across the state that techniques can be applied to improve small-game habitat in conjunction with almost any agricultural or forestry program. Current plans are to integrate these wildlife demonstration farms into landowner-recognition programs such as the forest-stewardship program, which stresses multiple use of forestland, or the similar Gold Medal Farms program being developed by the N.C. Department of Agriculture. Landowners who take part in the demonstration farm program have chosen to manage their land for wildlife as well as economic gain. Though many of the land management practices implemented to benefit wildlife require little expenditure, others do sacrifice some crop or timber production.

All eight landowners who currently participate in the wildlife demonstration farm program are working in their communities at the grass-roots level to encourage fellow landowners to consider wildlife needs when making land-management decisions. In addition, publicity generated by their efforts is reaching landowners statewide. People are beginning to pay attention.

Who knows? Gary Rorie may yet make the cover of *Progressive Farmer*. But if he does, you can be certain that Al Griffin will have an *Outdoor Life* photographer in the White Store community within the month. ☒

Terry Sharpe is the small-game project leader for the N.C. Wildlife Resources Commission.

STEVE MASLOWSKI

Since 1981, Quail Unlimited's army has grown to 45,000 dedicated volunteers whose goal is to restore bobwhite quail populations.

BATTLING FOR BOBWHITES

by Vic Venters

Quail Unlimited is one group that's determined to try to reverse the downward spiral of small-game populations, especially those of bobwhite quail. This organization is actively helping sportsmen and landowners improve quail and other small-game habitat by working collectively with state wildlife agencies like the N.C. Wildlife Resources Commission.

Founded in Augusta, Georgia, in 1981, QU has since spread beyond the traditional bobwhite country of the Old South to become a national conservation organization. Today membership stands at 45,000 with 300 chapters nationwide. In North Carolina, QU has over 4,000 members and 15 active chapters. QU's primary conservation focus has been, and continues to be, habitat improvement and preservation. "While we don't have a handle on all the factors causing quail declines, the biggest reason is probably habitat loss," said Don Buckland, QU's Regional Director for the mid-Atlantic states. "Going the habitat-improvement route is the most logical method for us, and it's also something we can directly affect and improve."

Bobwhite quail need four habitat components to flourish: food, nesting cover, winter cover and water. To this end, QU works on both private and public lands to provide those components. Last year in North Carolina, QU planted 93 miles of food strips on public land and 614 miles on private land, distributing 63,000 pounds of free seed in the process. It's also worked to provide the other vital components of quail habitat by prescribed burning and selective land clearing. On the education and information front, it sponsors landowner workshops and coordinates youth education programs.

Each chapter raises funds at annual conservation banquets. Of that money, 20 percent goes to QU national headquarters, another 20 percent goes to respective QU state councils, while the lion's share — 60 percent — remains with the individual chapter for local habitat work. This flexibility allows each chapter to respond best to the area's immediate needs. This doesn't mean local QU chapters go it alone, however. Most work with the Wildlife Commission, as well as with state agricultural agencies, providing funds, manpower or both for cooperative projects.

"This arrangement works out quite well for us," Buckland said. "These chapters are like people; each has its own personality. Some provide manpower for projects, others provide funds to the Wildlife Commission for projects chosen in cooperation with the local chapter." Below are just a few examples of QU's recent work in North Carolina.

Habitat Improvement: Most of QU's chapters take part in seed distribution and food plots projects. The Cape Fear QU chapter is also funding an intensive management project on the Holly Shelter Game Land. A 200-acre area of pocosin and longleaf pine ridge will be prescribe-burned by the Wildlife Commission at a frequency most conducive to bobwhite production. Aside from benefitting the quail in the gameland area, the burning will serve as a public model for those interested in similar management on private lands.

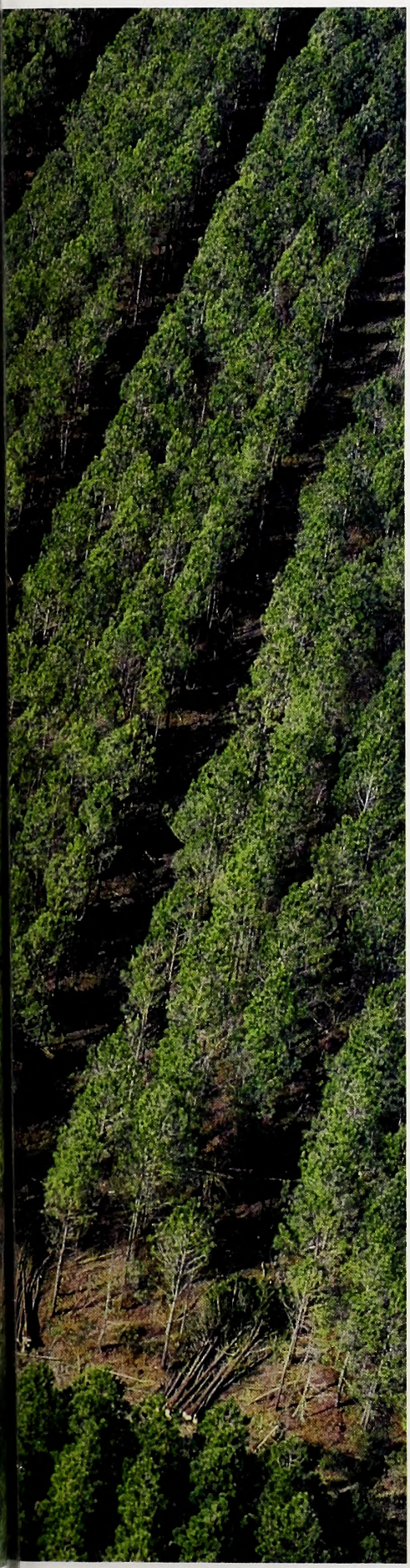
Information: In addition to providing the U.S. Forest Service with 20,000 bicolor lespedeza seedlings for planting on the Gardner-Webb Game Land, the Tri-County QU chapter in Lincoln, Gaston and Cleveland counties is planning a project on a Lincoln County-owned 15-acre parcel to develop a wildlife management and demonstration area that will be open to schools, interested groups and landowners.

Youth Programs: The Johnston County QU chapter sponsors a youth project at local high schools. Students in the Future Farmers of America program at each school maintain a food plot. The food plots are judged and prizes awarded. "Last year, 286 students took part in this program in Johnston County," Buckland explained. "We're educating future land managers on the need for quality quail habitat. We'd like to see more emphasis placed on our youth. That's where the future lies."

While habitat improvement remains QU's priority mission, the North Carolina council is looking to expand its research efforts. A proposal has been sent to national QU headquarters to fund a long-term research study examining nonhabitat factors that may be affecting quail populations. Pesticide and herbicide poisoning, disease from pen-raised quail, predation and late-season hunting mortality are all factors that may be interacting to depress quail populations. Another goal for the proposal would help QU become a clearinghouse for the vast amount of data that has been collected on bobwhite quail biology over the years. By centralizing this data — much of it spread around the nation — bobwhite researchers could have easier access to important, and perhaps overlooked, material.

Today, the South's treasured bobwhite hunting tradition is — if not endangered — standing on unsteady legs with its back on the ropes. To reverse the bobwhite's decline will take money, time and an unrelenting effort to preserve and improve habitat. "Quail and small game are a product of the land," Buckland said. "People have got to know that you have to actively manage your land for quail. It takes some work, but we're here to help." ⊠

For more information on QU, write Quail Unlimited National Headquarters, P.O. Box 10041, Augusta, Georgia 30903, or call (803) 637-5731.



WEYERHAEUSER

FORESTRY UNDER FIRE PART ONE

Wetlands & Pine Plantations

What happens to a wetland when you put a pine plantation in it? The answer to that question may change the face of eastern North Carolina.

by Lawrence S. Earley

***Foresters thin** a 28-year-old pine plantation on a Weyerhaeuser wetland site in eastern North Carolina (left). Thinned once before, the trees will be clearcut at about age 40. Plantations on wetlands produce large amounts of wood for paper products and sawtimber (below). But some wonder about the long-term environmental costs of such intensive forestry.*

LAWRENCE S. EARLEY

The Weyerhaeuser forester speaks quickly and with emotion. "This wetlands issue has tremendous effects on economic growth in eastern North Carolina," he says. And then: "Our obligation is to make a good rate of return to our investors. I think the environmental community needs to understand that...." He pauses for a second, starts over. "We feel like we can have the cake and eat it too. In many cases all environmentalists want is the cake."

The battle lines are forming in eastern North Carolina, and the engagement promises to be lengthy. The struggle that looms is, in a manner of speaking, over cake: whether North Carolina can have it — preserve our valuable and vanishing wetlands, that is — and eat it, too — produce an endless supply of pulp and sawtimber from them.

The outcome of the controversy will affect the status of our wetland resources, and it will also affect the way the forest industry does business. Until now, the big timber companies in the East have been able to operate without much regard to their effects on wetlands. Like agriculture, they are exempt from laws that seek to protect wetlands. But their exemptions are looking shakier in the wake of a growing national consensus that the destruction of our nation's wetlands must stop. According to the U.S. Fish and Wildlife Service, 53 percent of the wetlands in the lower 50 states have been destroyed since 1780. Estimates of North Carolina's loss are controversial, but they may amount to 49 percent, much of it in the past 30 years. Responding to a national outcry over these continuing losses, President George Bush and the nation's governors endorsed a "no-net-loss" policy toward wetlands in 1989, and federal agencies are adopting a new, get-tough attitude toward all activities in wetlands.

FORESTRY UNDER FIRE PART ONE

Wetlands & Pine Plantations

JACK DERMID

Black bear cub *climbs in a longleaf pine tree adjacent to a pocosin wetland (right). Intensive forestry has turned many natural pocosins (below) into loblolly pine plantations. Unique to North and South Carolina, pocosin wetlands are characterized by acid soils, seasonally high water tables and a dense, evergreen shrub layer. Pocosins offer "habitat of last resort" to species like the black bear, a declining wildlife species in eastern North Carolina.*

With 2.1 million corporate acres of land concentrated in North Carolina's wetlands-rich Coastal Plain, Weyerhaeuser and other timber company giants are feeling the effects of this regulatory scrutiny. The stakes are enormous. "The most productive loblolly pine plantations in the South are intensively managed wetlands," says Weyerhaeuser. For conservationists, however, the issue is whether the national goal of wetlands preservation is compatible with the intensive forestry that timber companies practice.

On a stormy morning last August, I drove to New Bern, the headquarters of Weyerhaeuser's North Carolina operations. Weyerhaeuser is one of the largest timber companies in the nation, and the largest in North Carolina. Other major timber companies with substantial holdings in the state are Union Camp, Georgia Pacific, International Paper Company, Champion International and Federal Paperboard.

I was at Weyerhaeuser to see how intensive forestry is practiced in one of the most unique forested wetland types in the country, the pocosin. Forested wetlands also include the rich alluvial bottomland systems found along rivers, as well as Carolina bays, wet pine flats and savannas. But when Weyerhaeuser began to acquire lands in the 1950s, it concentrated its holdings in about a dozen pocosins, and for good reasons. They contained a lot of pine (mostly pond pine with some loblolly) and they were located close to mills. Moreover, the pocosins' level topography was ideal for plantations and, perhaps as important, the land was cheap. For as little as $5 an acre, Weyerhaeuser put together huge, contiguous tracts that facilitated plantation management.

Timber companies prefer the plantation method of growing trees because it's the most reliable source of wood, mostly pine but some hardwood. But plantations often require intensive, landscape-altering operations. First a network of roads is built to create access to a tract and the original vegetation is removed. On wet sites, the land must be drained, and at Weyerhaeuser drainage is all engineering wizardry involving thousands of miles of ditches and canals. Before the pines can be planted, the site is prepared by scraping away logging debris, raking, chopping, harrowing and sometimes burning the land. Raised beds are made and planted with genetically superior loblolly pine seedlings, which are treated with herbicides to eliminate competing vegetation and fertilized to make them grow fast. The stand is clear-cut in 35 to 45 years and the process begins all over.

The results are rows upon rows of even-aged loblolly pine trees, planted and grown like a field of corn. In fact, the intent of plantation forestry is to treat tree growing like farming. Of Weyerhaeuser's 600,000 acres, nearly 400,000 are in plantations, almost all of it in pine.

As ubiquitous as pine plantations are across the South, it bears remembering that intensive forestry of this type is only about 25 years old. In 1970, Southern pine plantations produced only 4 percent of the pine harvested. By 1984, the proportion of plantation pine had risen to 18 percent and industry experts now expect plantations to produce 54 percent of the pines by the year 2000. If so, a lot of pine trees will be grown in wetlands.

My guides on the trip were Joe Hughes, the station manager at the Forestry Research Station at New Bern; Charlie Williams, environmental forester; and Bob Hollatschek, the North Neuse district manager. The heavy rain slickened the dirt roads that led into the heart of the company's land. We were entering a landscape known for decades as The Big Pocosin. It was Hollatschek's district, part of a 160,000-acre expanse between the Neuse and Pamlico rivers in Craven and Beaufort counties, about 35 feet above sea level and sloping gently eastward. Hughes calls it "The Big P" and he knows it well because his family has lived near it for seven generations. Originally a 10-mile-by-10-mile expanse of dense pocosin, today it's mostly pine plantations.

We parked on the muddy road and walked into a 13-year old plantation that had been thinned recently. Plantation trees are not all harvested at the same time; sometimes stands are thinned at about 13 years and thinned again at age 19 or 20. "Normally in our first, partial thinning, we take out every fifth row for access and then selectively thin the adjoining rows," said Hollatschek. "It works out to approximately every other tree. Then in the second thinning we use the same access corridors and remove additional trees as needed."

"We get more wood from thinning than from clear-cutting," added Williams. "If you look at the total volume removed from our land, about 58 percent was derived from thinning, as opposed to 42 percent from clear-cuts. And what we're thinning are the very worst trees. We're holding the best for that full 40-year rotation, for that high-quality sawtimber that we think will be in short supply beyond the year 2000."

"It's a lot easier to defend our strategy than to defend a 20-year pulp rotation," said Hughes.

They pointed out the brushy undergrowth of switchcane reed, red maple and wax myrtle growing in response to the additional light created by the thinning. "If you didn't know that this was a plantation," said Williams, "you could almost think it was a natural stand."

Biologists would probably take issue with that statement. To many, there's hardly anything more unlike the regimented world of a

Pocosins are too shady *for many plant species to grow, but the open edges between pocosins and pine savannas are rich in insectivorous plants such as this Venus's flytrap. This plant is found only in North and South Carolina, in settings so nutrient-poor that botanists believe the plants' insect appetite evolved to help them pick up extra nutrients for growth.*

JACK DERMID

FORESTRY UNDER FIRE PART ONE

Wetlands & Pine Plantations

pine plantation than the chaotic, densely vegetated wetland ecosystem that it replaced, the pocosin. The old Indian description, "swamp on a hill," still gives the best idea of a pocosin. It's an upland wetland having a slightly domed shape. Many pocosins are peat-bottomed, others even have mineral soil, so it's not surprising that pocosin definitions tend to shift around somewhat hazily. Depending on who's defining them, the term embraces nearly treeless low pocosins made up mostly of knee-high shrubs over peaty soil; somewhat higher pocosins dominated by pond pines; and pocosins on richer soils consisting of a diverse, multilevel canopy forest.

Despite the different forms they take, pocosins share three characteristics: they get their water from precipitation, their soil is acidic and mostly nutrient poor, and the vegetation consists of a nearly impenetrable shrub layer of mostly evergreen species. In a typical pocosin, you have to fight your way through a thick wall of red and sweet bay trees, gallberries and ti-ti, all knit together by the everpresent, thorny, hat-snatching and temper-provoking greenbrier.

It's this formidable vegetation that explains the pocosin's reputation as an inimical, forbidding landscape. Yet until recently it was the seasonally high water table that defeated most efforts to exploit pocosins. Flying over the peninsulas between the Albemarle and the Pamlico rivers, and the Pamlico and the Neuse rivers, where many pocosins are found, you see few streams draining this vast landscape. Water drains very slowly beneath the soil toward the estuaries and the water table holds high most of the year, especially in winter and spring.

Two other things about pocosins: they are unique — they occur only in North and South Carolina — and they cover vast expanses of eastern North Carolina and covered even more at one time. Duke University professor Curtis Richardson estimated in 1981 that there were over 2.2 million acres of pocosins in eastern North Carolina in 1962, a figure that represented 70 percent of all the pocosins in the world.

Weyerhaeuser's first attempts at growing pines in the pocosins were disappointing. "We did our first bedded plantation in 1968," said Hollatschek. "Before that we had done a lot of aerial seeding, but few tracts worked out." After a particularly disastrous year in 1972, caused by rainfall 15 to 20 inches more than average, Weyerhaeuser added a massive drainage effort to their bedding. A grid system of

Unimpeded drainage *from agricultural fields and pine plantations has been blamed for funneling pulses of fresh water laden with sediment and chemicals into estuaries. This fresh water can interfere with the salinity levels required by fish and shellfish. Flashboard riser dams (below) in ditches help foresters reduce these freshwater pulses and maintain proper water levels for growing trees. But timber companies have installed only a small number of flashboard risers.*

KEN TAYLOR

High rainfall *and low evaporation in winter bring the water table to the surface in this recently converted pocosin (top). By intensively managing plantations through ditches and bedded mounds, foresters help pine seedlings survive this wet period. The pocosin ecosystem has been removed, however. Two-year-old pines (below) grow fast in these manipulated conditions.*

WEYERHAEUSER

WEYERHAEUSER

ditches increased drainage from about two miles of ditches per square mile of land before 1972 to up to 16 miles of ditching per square mile after 1972. Field ditches emptied into roadside canals, which emptied into a natural drain. Most ditches are spaced every 660 feet — 10 chains, in foresters' parlance — while, depending on the site, others are twice that far apart and some are only 330 feet apart.

Until the late 1970s, Weyerhaeuser's drainage philosophy, like that of most other timber companies, was to get the water off the land as fast as it would flow. But then the company changed to a "water management" approach. Engineers installed a system of flashboard risers, or dams, in some roadside canals to manipulate water levels in the plantations. During harvesting or bedding, the flashboards are raised to lower the water table temporarily; when the harvesting or bedding is completed, they are dropped again.

"We think it's good for tree growth," explains Charlie Williams. "Loblolly pine quits growing when the soil dries out." The dam system also helps store excess water after heavy rainstorms, preventing massive pulses of fresh water from shooting into the estuaries.

The benefits of these intensive treatments have been persuasive to Weyerhaeuser. As early as 1974, their pocosin pine plantations were among the most productive forests in the South. Drained plots produce up to 10 times the amount of wood of undrained plots, according to Hughes. A single herbicide treatment results in an extra 3 to 8 feet of growth. Bedding produces an extra 40 feet of growth.

"Southern pine plantations are a must — no other option will produce the projected demand for wood," said Joe Hughes at a workshop earlier this year. "Wetlands are *the* most productive forest lands," he said proudly as we stood in The Big Pocosin and gazed at the little pine trees growing in a row.

It's a sight that tends to drive critics of intensive forestry to apoplexy, yet they haven't been too successful at changing the industry's approach.

From the beginning, alarm was raised not only by the speed with which pocosins were being developed, but also by the scale of the conversions. Though the exact acreage of pocosin drainage is controversial, one estimate is that a third has been drained for agriculture, forestry or residential development, while another third has been partially drained. Although 20 percent of the pocosins have been protected by public ownership, timber companies still own about 44 percent of the remainder, most of them potentially slated for plantations.

As early as the 1970s, scientists suspected that the effects of this massive draining would show up in at least three areas: the hydrology of the pocosin, or its ability to store rainfall like a sponge and release it slowly to the surrounding estuaries; the water quality of the estuaries into which the ditches emptied; and the way that a pocosin functions as wildlife habitat.

And indeed, researchers in the 1970s found a host of problems caused by the so-called "Super Farms," the massive agribusiness operations whose row crops sometimes stretched

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from horizon to horizon. (Most of these large farms, among them First Colony Farms, have since gone bankrupt.) One Division of Marine Fisheries report in 1981 confirmed that runoff from drainage systems could "contribute substantial amounts of bacteria, nutrients, pesticides and sediments to the waters into which it drains." After heavy rainstorms, ditches carried great pulses of fresh water into the estuaries, diluting the saltwater content and forcing salinity-sensitive fish and shellfish species out of their traditional nursery areas. Drainage is still suspected as a cause of the plummeting hauls of commercial fishermen in some of North Carolina's estuaries.

Those few studies that have focused on the impacts of pine plantations have failed to come up with a smoking gun. "In your heart of hearts, you know they're doing (some damage)," says one researcher, but well-managed forestry operations like Weyerhaeuser's still haven't been tied to major disruptions of the estuarine ecosystem.

Weyerhaeuser's own studies may constitute one of the only long-term research efforts to date. Since 1985, the company has studied the effects of its operations on the hydrology of a pocosin wetland and the biology of an adjacent estuary. Its studies show that the quality of the runoff from its managed plantation lands "is better than water in the estuary into which it flows." Sediment levels are low, as are nutrient levels, and the runoff has negligible effects on salinity, according to Weyerhaeuser. Of course, these results have only a slim bearing on the question of forestry's current impact on estuaries. For one thing, Weyerhaeuser admits that it has installed flashboard risers on only half — perhaps not that many — of its canals. And many other timber operations don't use the risers at all.

Yet a scientist who worked on portions of Weyerhaeuser's study wonders whether such studies will ever register the true effects of intensive forestry operations. "If you take a pocosin and convert it to a pine plantation, you've done something fairly dramatic on the land," says William Kirby-Smith of the Duke Marine Lab in Beaufort. "But I think it's difficult to document the effects of this land use on water quality in systems unless it's fairly dramatic, unless you've got an industry that's putting out a pollutant."

Although his preferred alternative for pocosins is public acquisition, Kirby-Smith still ranks forestry as the best development alternative, above agriculture and well above urban development.

Division of Environmental Management officials tend to agree, finding that well-managed silvicultural activities in eastern North Carolina have fewer effects on water quality than other kinds of development. "There are streams degraded by improper forestry, but forestry in general has not been a big issue," says Boyd Devane, environmental supervisor with DEM.

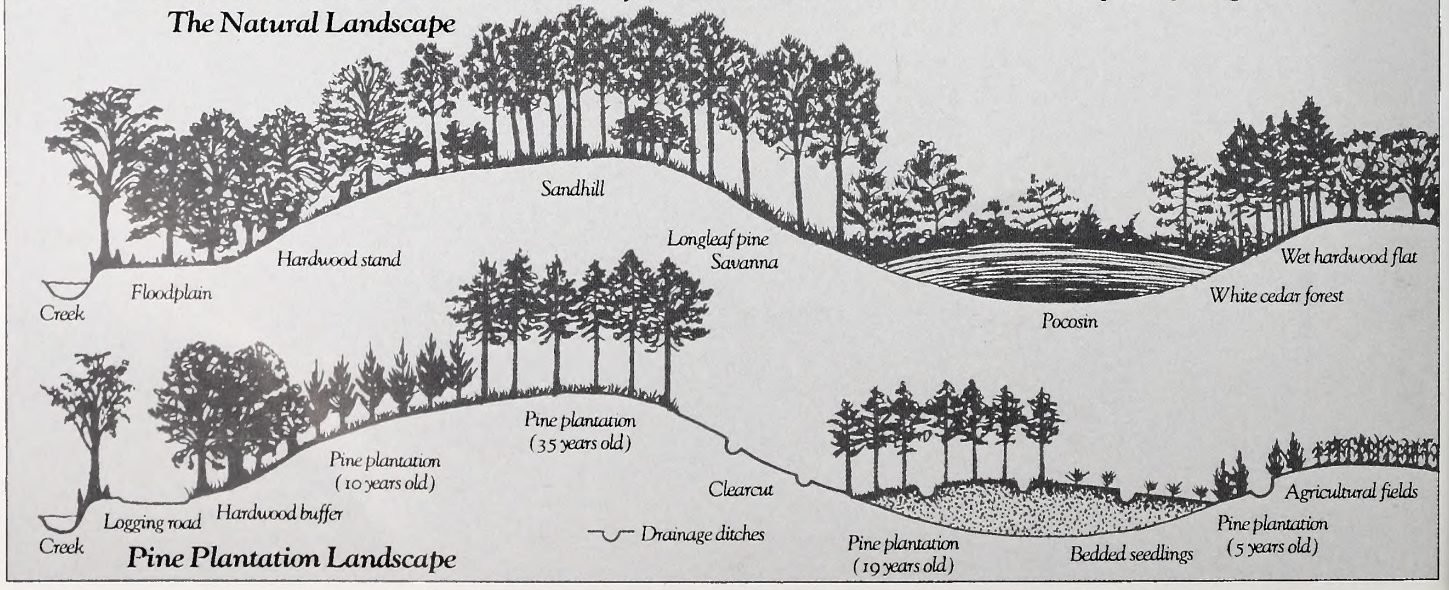
Biologists have better luck attacking pine plantations from the point of view of their impacts on habitat and animal diversity. Plantations, they say, generally are poorer habitat for wildlife than natural forests. "If you cut the pocosin out, windrow the slash and bed the soil, you're hitting the land pretty hard," says Wildlife Commission biologist Dennis Stewart, one of the most outspoken critics of pine plantations in wetland sites. "And if you treat it with selective herbicides after that, to eliminate competition with pine seedlings, then you're reducing the diversity in the plant community which provides the food base for wildlife communities."

This short-rotation, even-aged forest is managed to produce a single tree species, one of little food value for animals. The simplification of the food chain has predictable ripples up and down the web of life. The early years of a plantation may offer white-tailed deer lots of food, but in a few years this will be eliminated as the canopy spreads and shades out the understory food species. Meanwhile, cavity nesters will drop out of the forest because there are no older (60-plus years) cavity-forming trees. Black bears drop out because they lack the fruits, berries and acorns that come from a diverse plant community. Wild turkeys may also drop out because the understories of young plantations are too dense for them.

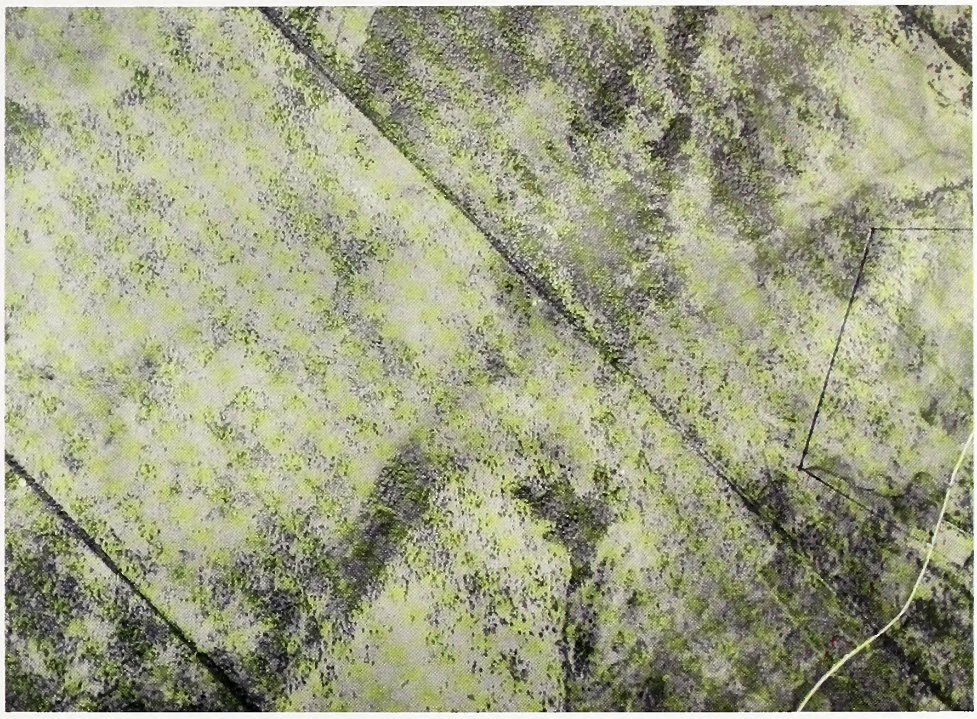
Moreover, converting pocosins to pine plantations on the scale pursued by industrial

Biodiversity & the Landscape

Biological diversity declines when a single habitat such as a pine plantation replaces a mosaic of natural communities. The natural communities consist of many different plant species, old and young, that offer a variety of habitats for many animals. In a pine plantation, even one with a variety of age classes, the number of plant species is reduced, the age classes are relatively young, and the wildlife is less diverse. These results across a broad landscape worry biologists.



These two photos *taken in 1948 (top) and 1978 (below) show the transformation of The Big Pocosin in Craven and Beaufort counties. By 1978, drainage ditches and canals for pine plantations had increased fourfold. For foresters, these two scenes illustrate the benefits of engineering to grow a plentiful supply of wood. For environmentalists, the scenes are reminders of how the Coastal Plain has been transformed by massive wetland conversions.*



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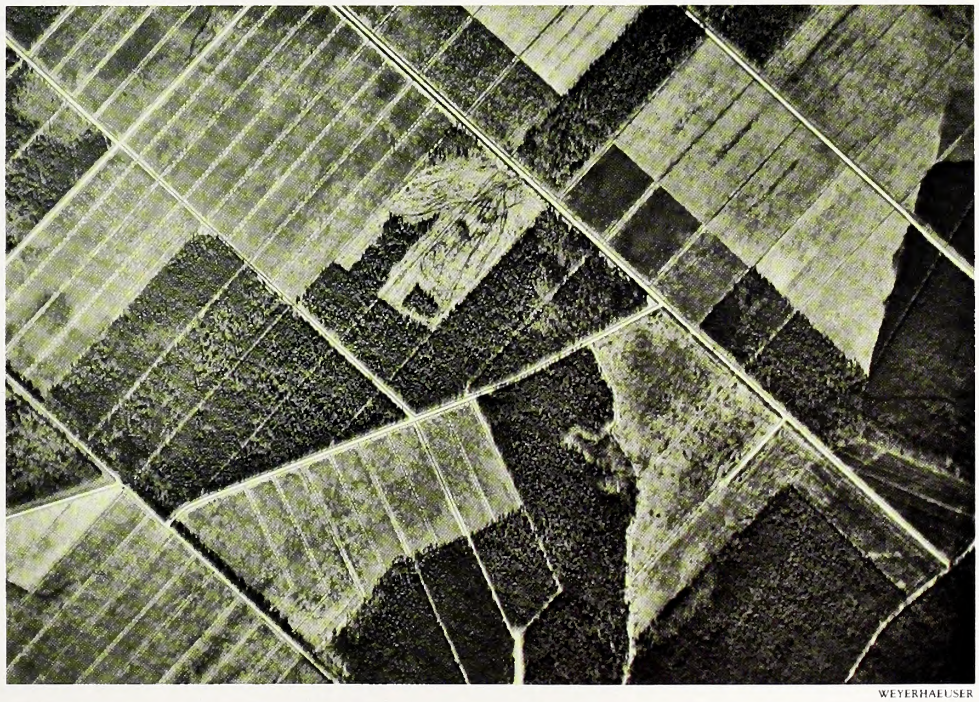

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forestry threatens to reduce habitat diversity over a vast region.

Yet, handicapping traditional biological criticism of pine monoculture is the fact that most pocosins seem to have less wildlife diversity than an alluvial habitat like a bottomland hardwood swamp. Says Wilson Laney of the U.S. Fish and Wildlife Service in Raleigh, "If you're trying to justify pocosin preservation from a wildlife standpoint alone, it would appear that they are not perhaps as diverse as other systems are and may not even be a preferred habitat as far as permanent year-round residents go." He adds that much work needs to be done before we fully understand the natural values of pocosins for wildlife, especially the pocosin interiors.

Weyerhaeuser foresters argue that by planting and harvesting in a complicated system of rotations, they have ensured that there's always plenty of wildlife food available. Their plantations support more deer than a natural pocosin stand. "We may have too many deer in eastern North Carolina, but don't tell that to a hunter during deer season," says Charlie Williams. Wild turkeys have even been seen in the plantations, and the claw marks of black bears are visible there, although it's not clear whether the bears were just moving through to get to a natural pocosin stand.

One species whose fate in the Coastal Plain may hinge on the presence of pocosins is the black bear. Pocosin habitat is crucial for bears because of its seasonal production of foods like bitter gallberry and the dense thickets that the bears use for denning during the winter. "Pocosins may not be the preferred habitat and may not provide all the life requisites for a host of species," says Laney, "but because they are the only large unfragmented tracts of habitat left, they have value from that perspective."

Robert Nofsinger, Fish and Wildlife Service biologist with the Alligator River National Wildlife Refuge, agrees: "We don't need any more early successional habitats such as pine forests. What we're losing is forest interiors, relatively unfragmented, for black bears and neotropical birds. The real natural value of pocosins is their large size."

The scale of the pocosin landscape also occupies the attention of another researcher, Mark Brinson, professor of biology at East Carolina University. He suggests that pocosins are not only regulating the water quality of the estuaries, but because of their vast scale they may be regulating regional air quality as well, much as tropical rain forests do. The cumulative effect of agricultural and silvicultural conversions may be impairing this important role, he warns. "It's something we need to be more aware of and put into a national or even international perspective," he says.

Arguments and speculations like these might have continued for years without ever threatening the status quo. Foresters seemed invulnerable behind their exemptions from regulation, and conservationists seemed resigned to carping impotently. But in the last two years, a new day has dawned in wetlands protection, and wetlands forestry is facing its first serious challenge. Now foresters are stirring uneasily while environmentalists confidently gird themselves for battle. ☒

Part II of "Forestry under Fire" will appear in the December issue of Wildlife in North Carolina.

BATS AREN'T SO BAD

Considering how many harmful insects they eat and how few people they actually harm, perhaps we should change the way we feel about—ugh!—bats.

written by Doug Elliott ©1990
photographed by James Parnell

The first day of spring had been warm and bright, a breath of balmy weather that caused me to break my winter dormancy and spend the day outside. I had been pruning in the orchard, planting in the garden, cleaning out the bluebird boxes and raking up the yard.

About sunset, I took a break and sat down beside the flowering plum tree. I was surprised and pleased to see my first bat of the season, a tawny-furred red bat. The warm spring weather could have aroused it from hibernation or possibly it had just arrived on a northward migration. Its orange-tan fur was ablaze with the golden evening light, and it was a magnificent sight as it fluttered and swooped in silent, graceful arcs, not 40 feet from where I sat. I

***Townsend's** big-eared bat (*Plecotus townsendii*) is one of three federally endangered bat species found in North Carolina (far left). This colony of southeastern myotis bats (*Myotis austroriparius*) is roosting (above). Caves with stable temperatures and high humidity make ideal roosting areas, although some species use buildings or hollow trees.*

had been watching it for less than a minute when out of the setting sun darted a small, gray, sharp-shinned hawk that snatched the bat from its aerial reverie. The bat emitted one sharp squeak. I gasped. Then, for a split second, the world stood still as the mammal and the bird, this unlikely duo, locked in a one-sided embrace, sailed off into the woods to fulfill their respective destinies as predator and prey.

So goes the life of a bat. A bat's list of enemies is long and varied, including not only various species of hawks, but also owls, opossums, mink, weasels, raccoons, cats and snakes. Fish, such as trout and bass, have been known to eat bats; even frogs eat them. Of course, a bat's worst enemy is human ignorance and fear.

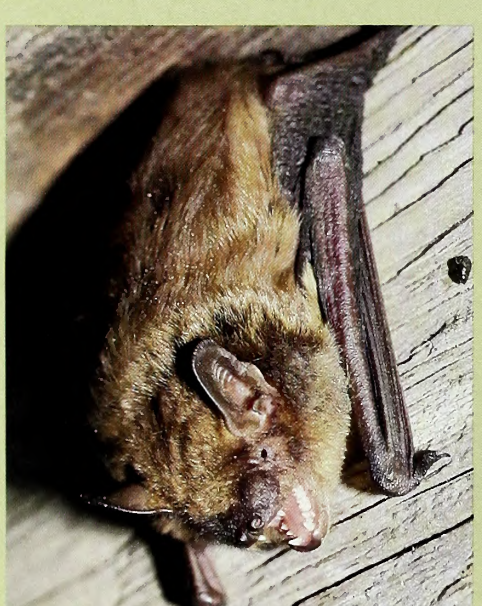
I'll never forget a lecture I heard about bats. The speaker was an authority on these amazing flying mammals and was dazzling his audience with one fascinating piece of bat trivia after another. Every so often during his presentation, a wry smile would cross his face and he would effect an accent and say, "Now ever'body knows that bats get caught in yer hair, suck yer blood till you turn white and die and give you rabies." He did this often enough that before long he had the audience merrily repeating it with him as a chorus. What he was doing was summarizing the general public's fear and loathing of bats and turning it into humor.

The more we learn about bats, the more we realize how unfounded these fears are. Bats are one of the most misunderstood yet most valuable and fascinating of our native mammals.

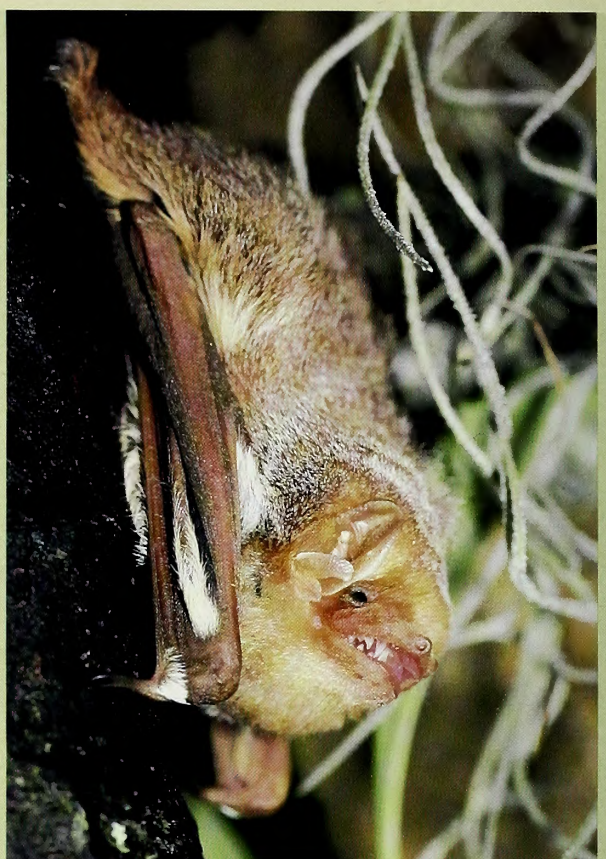
They are the only mammals capable of sustained flight. The front legs are like our arms and hands, with greatly elongated fingers con-

North Carolina Bats

Evening Bat (*Nycticeius humeralis*)



Big Brown Bat (*Eptesicus fuscus*)



Red Bat (*Lasiurus borealis*)

Sixteen species of bats (in two families and seven genera) have been recorded in North Carolina. Several of these are relatively rare and three — the Townsend's big-eared bat (*Plecotus townsendii*) and two bats of the *Myotis* genus, the Indiana bat (*Myotis sodalis*) and the gray bat (*Myotis grisescens*), — are endangered species. The other *Myotis* bats here are the little brown bat (*M. lucifugus*), the southeastern bat (*M. austroriparius*), Keen's myotis (*M. keenii*) and the small-footed myotis (*M. leibii*). Other bats found in our state are the silver-haired bat (*Lasionycteris noctivagans*), the eastern pipistrelle bat (*Pipistrellus subflavus*), the big brown bat (*Eptesicus fuscus*), the red bat (*Lasiurus borealis*), the Seminole bat (*Lasiurus seminolus*), the hoary bat (*Lasiurus cinereus*), the evening bat (*Nycticeius humeralis*), Rafinesque's big-eared bat (*Plecotus rafinesquii*) and the Brazilian free-tailed bat (*Tadarida brasiliensis*).

nected by a very thin membrane of skin.

Bats are not blind. All species have eyes and some have quite good vision. However, hearing is more important to bats than eyesight. They locate prey and orient themselves in their environment by echolocation. Echolocation is also used by whales, dolphins, shrews and modern submarines. Bats echolocate by producing a series of short pulses of high-frequency sound (from 15 to 200 squeaks per second), a sound too high-pitched to be heard by the human ear. This may be fortunate, however, since some of these signals have been compared in intensity to jet engines. (Think what that could do to a quiet summer night in the country.) As the sound travels through the air, it spreads out. When it hits an object it is reflected back in the form of an echo. From these echoes a bat can tell the size, shape and texture of an object, and the distance to it. If the object is moving, the bat can even determine its speed and direction. With this information, the bat formulates a detailed sonic image of its surroundings. It is able to track and intercept flying insects as small as fruit flies and can maneuver to avoid obstacles as fine as a single human hair (which shows how unlikely it is that a bat might become entangled in a head full of hairs).

Bat experts I consulted indicated they had never heard of an instance in which a bat became entangled in someone's hair, but one told me this belief might have evolved from the fact that young big brown bats (*Eptesicus fuscus*) cling tightly to their mother's fur when they are carried in flight. Often big brown bats

roost in barns and attics. Since the young sometimes fall out of the roost and are rescued by the mother in this way, it is possible that a young bat might land on someone's head. If so, the terrified little creature might instinctively cling to the hair, giving both the bat and its unwilling host a moment of true horror.

Bats in our temperate climate eat insects exclusively — lots of them. Bats are our most important predators of night-flying insects, and studies have shown that a single little brown bat can catch 600 mosquitoes in an hour. A single endangered gray bat can eat 3,000 or more insects a night. A large bat colony inhabiting Bracken Cave in Texas has been estimated to consume a quarter of a million pounds of insects in a single night.

Bats usually capture and eat their insects on the wing. They either seize the insects directly in the mouth or use their wings like a tennis racket to deflect and bounce the insects into the mouth. They also commonly use the membrane that connects the tail with the hind legs (the *uropatagium*) as a scoop to capture prey. The red bat, after trapping an insect in its curled tail, tucks its head down into the pocket formed by the tail membrane to collect the insect in its mouth. In the process it folds its wings and performs a complete split-second aerobatic somersault, and it does this hundreds of times in the course of an evening feeding flight. To an observer, it looks like no more than an erratic flutter.

Most interactions between a bat and its insect prey are uncontested encounters from which the insect rarely escapes, but recently it was discovered that certain moths have built-in "fuzzbusters." These bat radar detectors are actually simple ears located on either side of the moth's thorax that are sensitive to the ultrasound range used by many bats. When one of these moths detects an approaching bat, it adopts a series of evasive flight patterns including loops, abrupt turns and vertical dives into protective vegetation. Some moths can even generate a sequence of ultrasonic clicks that mimic the bat's signals and "jam" the bat's echolocating system, causing a pursuing bat to break off its attack. And you thought modern aircraft sonar technology was sophisticated?

Many bats in the tropics subsist on pollen, nectar and fruits, and they play important roles in the pollination and dispersal of the seeds of many tropical plants including a number of crops. If you enjoy bananas, cashews, dates, figs, mangos, avocados or tequila you can thank a bat. Likewise if you have ever benefited from the security of a kapok-filled life preserver or found a piece of sisal baling twine handy, you can also thank a bat. Through the course of evolution, bats have played an essential role in the survival of these valuable plants in their tropical environment. Some tropical crops are still totally dependent on bats for pollination.

Not all bats eat insects. There are fish-eating bats, frog-eating bats and, yes, vampire bats. Vampire bats really do slurp fresh blood from living warm-blooded animals. These small, New World tropical bats weigh less than 2 ounces. In their native habitat they were originally rather rare, but with European colonization and the introduction of cattle, horses and other livestock their populations have grown. Now, vampires can be serious pests to domestic livestock, though they rarely bother humans. Vampire bats are not found in the United States.

During warm weather, bats roost in a variety of locations including the branches or hollow trunks of trees, clumps of Spanish moss, rock crevices, caves, attics, barns and the belfries of churches. In fact, some authorities maintain that the holy smell associated with many old churches is the direct product of bat colonies.

Some bats congregate in large summer roosts while others are solitary. Some species establish maternity colonies of females and their young, while the males form "bachelor" colonies elsewhere. Bats usually mate in the fall and the females carry the sperm with them into hibernation. The females give birth to from one to five young, usually in May or June. The little ones are on their own by late summer. As winter approaches, temperatures drop and insects become unavailable, and bats in our temperate climate must either hibernate or migrate. Some bats do both by migrating long distances (not necessarily southward) to their hibernating caves. Caves with a stable, cool temperature and high humidity are the ideal sites for most hibernating bats, though some hibernate in hollow trees or unheated buildings.

In the fall, as hibernating time nears, bats accumulate reserves of fat to sustain them through their winter torpor. In the depths of hibernation, the heart rate and breathing are greatly reduced. The metabolism slows down and the peripheral blood circulation to the wings and other extremities is shut down to reduce heat loss even further.

Occasionally, bats may become wakeful during warm spells in the winter and fly about drinking water and catching early emerging insects to supplement their dwindling fat reserves. The fat stores of most hibernating bats are just barely enough to carry them through the hibernating period. Therefore, if they are aroused or disturbed in winter, even if they are not physically harmed, this interruption can cause a fatal depletion of these reserves. Most responsible cavers and outdoor people know this and are careful not to molest bat colonies, especially when they are hibernating.

Many people are concerned that bats constitute a health hazard. It is true that, like most mammals, they can contract rabies. When they do, however, they quickly die and rarely become aggressive. No more than eight human deaths have been attributed to bats in the United States and Canada in the past 30 years — most from bites received while handling sick or dying bats. More people die each year from dog attacks, bee stings or lawn mower accidents than this 30-year total of deaths from bat rabies. Nevertheless, it would be foolish to handle sick bats that are lying on the ground.

People are occasionally bothered by bats that roost in the attics of their houses or outbuildings. Most of these colonies are small and pose no serious problems. Bats do not damage the paint work or structure of the buildings. Their droppings are usually dry and harmless and can sometimes be collected on a sheet of plastic spread beneath the roost and disposed of more easily than emptying a cat box.

Not everyone wants to get rid of bats. Because of their incredible efficiency at consuming large numbers of night-flying insects, some people are erecting bat-roosting boxes in their yards. Plans can be ordered for $2.50 from Bat Conservation International, P.O. Box 162603, Austin, Tex. 78716. Ask for the newest design for the Macrobat Dwelling. It's described as the "ultimate in bat condo living, shelter for 100 bats, and five fixed dividers allowing for different crevice widths combined with an 'attic' feature above for a greater diversity of species."

Along with your bat-house plans, you will receive a color catalog of everything a bat lover could want, including bat books, bat puppets, bat bumper stickers, bat Christmas cards, bat jewelry, bat T-shirts and even a bat nightgown.

So what do you do when late one summer night your kids, wife, husband or houseguests come running out of a room with terror in their eyes? If a bat is the problem, there are two approaches you can take. One is to arm everyone in the group with tennis rackets, baseball bats, and two-by-fours and march off to battle chanting "Bats get caught in yer hair, suck yer blood till you turn white and die and give you rabies!" A much better approach would be to open the windows and turn out the lights in that room. Then leave the room, close the door and allow the bat to fly out on its own.

Or, you could call Batman and hope, gulp, he's not afraid of real bats. ☒

Doug Elliott's most recent book, entitled Woodslore and Wildwoods Wisdom, *can be ordered from him at Possum Productions, Rt. 1, Box 388, Union Mills, N.C. 28167 for $10 postpaid.*

Bow Hunting for Small Game

The target may be small, but the challenge could hardly be bigger.

written by Eddie Nickens ©1990
photographed by Melissa McGaw

Fifteen years later it still is hard to believe, but this is, cross my heart, a true story. One fall afternoon Tim Lassiter and I walked into a large clearing from the woods where we'd been roving, shooting arrows at stumps and dirt clods and the occasional bushytail that allowed us close passage. Instantly I saw a mourning dove flying across the field, winging toward us with that erratic wingbeat that makes the species so easy to identify. Almost without thinking I nocked to my bowstring a blunt-tipped flu flu arrow, a shaft with oversized fletching that slows the projectile after a normal flight of 30 yards or so.

I'm going to shoot that bird, I told myself, and then I announced my intention aloud to Tim. His retort was less than complimentary, even for a 15-year-old. A dove, after all, is no easy target for a 30-inch shotgun pattern, much less a half-inch-wide, flattop arrow.

When the dove neared, I lifted, drew and aimed a 55-pound recurve in one motion, tracked the bird for an instant and released.

And I'll be darned if I didn't knock that bird right out of the sky. Even then I'd admit that my feat was a 50/50 blend of luck and chance, though I spent hours a day with a bow in hand. Still, Tim was impressed. Once his eyes returned to their normal size and location he congratulated me in a 15-year-old sort of way. "Betcha can't do it again," he said.

I would have lost money on that bet had I been fool enough to take it. During the next several years I loosed many an arrow on a flying gamebird but never did contact. Today, armed with a faster, flatter compound bow, there's a slightly better chance of arrowing a flying dove, but I'll not waste the energy, much less the arrows. If that one downed dove taught me anything other than the value of being at the right place at the right time, it showed me there was more to bowhunting than pursuing the white-tailed deer, and more potential in the bowhunter's season than those few months at the end of the year.

***In a sport** where success is measured in inches, accurate shooting is the vital ingredient for small-game bow hunting success. Practicing with specialized arrows, such as these flu flu arrows pictured right, is the best way to master this demanding hunting technique. The oversized fletching on the flu flu slows the arrow quickly after it exceeds normal hunting range, making it easier to find.*

Plenty has been said about small-game bowhunting as a tune-up for deer season, but in North Carolina, bow season for deer opens weeks before small-game seasons. A handful of mountain hunters can stalk groundhogs with bow prior to deer season, but most of us are out of legal reach of small-game bowhunting until during and after deer season opens. That makes it a great way of cooling off the motor after the first of the year—there's still a month of squirrel season left, and eight more weeks of rabbit season. Chances are, hard-working deer hunters have uncovered a handful of hot spots for small game—oak groves where squirrels congregate, thickets full of rabbits. After five months of preseason scouting and in-season deer hunting, taking to the squirrel woods with bow in hand might be just the potion needed by hunters who wonder if there isn't more at the end of the year than an eight-month wait for Opening Day.

Except for the ammunition, archery equipment for small game differs little from the outfit used for deer. A bow heavy enough to dispatch a deer no doubt will suffice for breadbox-sized quarry, yet archers with "variable draw weight" bows shouldn't loosen their limbs just because they don't need the killing power of a 70-pound bow. If the bow is comfortable drawn, keep it cranked up. What the bow-toting small-game hunter needs is the smallest margin of error possible, and that's provided by the heaviest draw weight a bow can carry. Flat trajectory is at a premium; if the arrow misses its mark by a few inches during deer season, it's still in the kill zone. Miss the mark by an inch or two while squirrel hunting and you'll spend half the morning digging arrow points out of trees—or half a paycheck replacing bent and splintered shafts.

The small-game bowman will have plenty of points from which to choose because the business end of the arrow is where a lot of small-game bowhunting technology has come to rest. Big-game animals felled by bow nearly always succumb to blood loss, hence an ever-expanding array of razor-bladed warheads.

Poised and silent, *the author waits to encounter the always-elusive Mr. Bushytail. During deer season, bow hunters have an excellent opportunity to locate small-game hotspots that can later be hunted when bigger prey is out of season.*

Arrow-dispatched small-game species, however, are mostly the victims of shock or the powerful punch provided by a variety of specialty arrowheads that can be tailored to the game at hand and the terrain to be hunted. Head afield with arrows tipped only with the venerable field point and a handful of blunts and your archery budget, if not your freezer, will wind up empty.

Consider the experience of an archer friend of mine. Once, while hunting rabbits in the fields near his vegetable garden, he arrowed a cottontail with a standard blunt-tipped arrow. The front half of the shaft passed through the rabbit and was stopped by the ground. Much to his surprise, the rabbit ran off into thick brush, arrow and all. Despite an exhaustive search, he lost both arrow and dinner, and no one wants to leave wounded game uncollected.

To keep from routinely emptying their wallets at the archery shop, many small-game bowhunters place a washer between the shaft and the screw-in field tip or blunt tip. The expanded diameter often prevents the arrow from passing completely through the target and increases the shock power of the hit. Available commercially is the Adder Small Game Point, which, like the washer home remedy, fits behind a field tip or blunt tip to add shock power and help prevent pass-through. Zwickey's Scorpio is a coiled wire grappler that fits behind any standard arrow point and creates drag as it slides up the arrow shaft. More aerodynamic than a washer, the Scorpio reduces pass-through but does allow some penetration, a key element when hunting turkeys and larger small game such as groundhogs.

But even such customized field tips and blunts fall short of the performance provided by specialized small-game arrow points, contraptions that give the archer both greater killing power and more control over the arrow after it leaves the bow. The best of this breed is the Zwickey Judo Point. At first glance this point looks like some miniature spy satellite; the shiny steel head has two recessed grooves amidship and ends in a small, blunt shocker point. Just aft of the tip the wires of a Scorpio wave, but these grapplers are designed to minimize arrow losses. When a Judo-pointed arrow hits the ground the wires toss the arrow into a tumble, hence its distinctive name. *Voila!* No more burrowed shafts to dig for.

Yet another specialty arrow point is designed particularly for shock power and is the ticket for squirrels. The Bludgeon small-game head is a 125-grain blunt mass of hard rubber that will bounce off tree trunks and absorb more shock than any other type of head. With Bludgeon-tipped shafts you won't have mushroom-headed and splintered aluminum shafts. Tipped with a Bludgeon

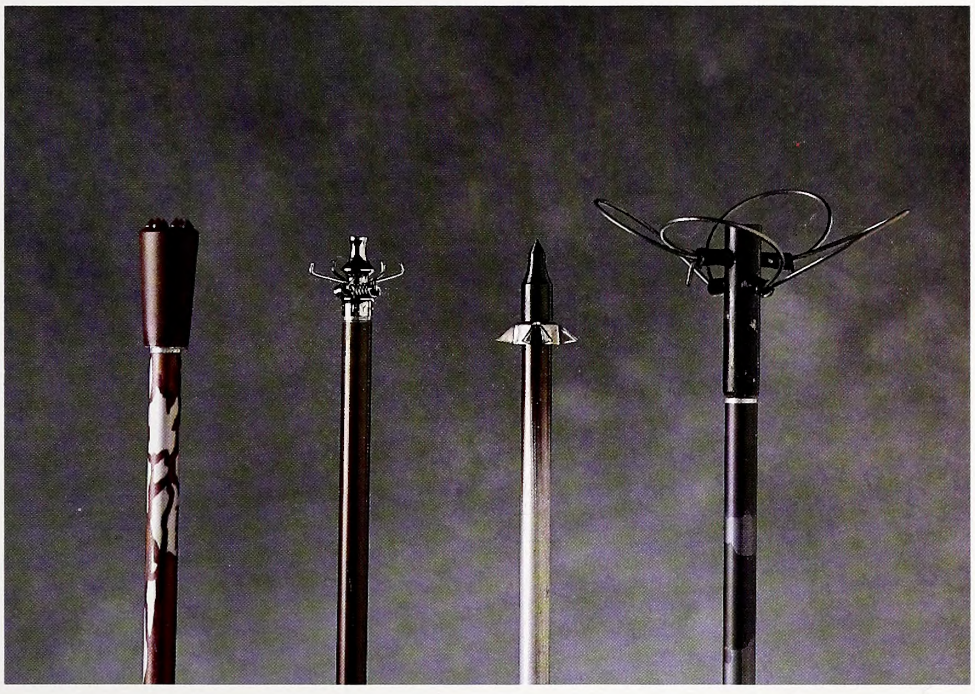
head, a flu flu arrow may well be your standard small-game ammunition, good for squirrels, birds and the occasional bunny.

These small-game bowhunting specialty items are for naught, however, if you can't place arrows on target. The vital zone of a deer is widely described as a dinner-plate-sized circle. That's more square footage than the entire silhouette of a squirrel or rabbit. To tighten your arrow groups on the range, whittle down your target size. Paper targets emblazoned with groundhogs and rabbits are available, but shooting at them will only tell you whether or not you're ready for the woods; other practice techniques will more quickly sharpen your skills. Shoot at matchbook-sized targets or concentrate on aiming at a particular point on the bull's-eye, perhaps at the apex of the centermost ring. Remember, bagging small game with a bow is a matter of inches, so practice on targets that force you to aim at smaller and smaller bull's-eyes.

To further cut that margin of error, you could try sighting aids such as peep sights or other minute-of-angle techniques. Some archers wrap a white thread around the bowstring just in front of their shooting eye; the thread serves as a crude rear sight to line up with the bowsight pins. Still other archers insist that the instinctive aiming method brings better results when shooting at a bounding bunny, but I'd rather wait for a sitting rabbit and a considered shot.

We've all heard about practicing by shooting through the center of tires rolled downhill, but have you ever seen anyone actually do it? It's too much trouble to retrieve the cumbersome targets. Nerf balls or other soft rubber orbs are more easily rolled downhill or bowled across flat terrain. Practice shooting overhead for a change. Deer hunters are browbeaten to shoot at all possible angles and from contorted positions, but how often have you loosed an arrow overhead? When I was immersed in the quest to duplicate my dove success I shot arrow after arrow at cardboard disks tossed up in the air, and such practice sharpens the skills of leading moving game and drawing, aiming and releasing in fluid movements—skills you just might use come deer season.

Once you've outfitted yourself with small-game accuracy and tailored equipment, the actual hunting of small game with bow and arrow differs little from pursuing small game with a rifle or shotgun, other than the short distances of the shots. Many small-game tactics are variations of big-game themes or takeoffs derived during deer season. Don't forget the venerable tree stand—not only does the higher vantage point keep you out of the sight line of ground-feeding squirrels, but you won't have to worry about your arrows careening through the woods. During last year's deer season I set up a tree stand in a strip of woods that separated two farm fields in Randolph County. Mature oak and hickory trees were scattered throughout the strip, and just to my left was an old blowdown and a trunk littered with acorn cuttings. You guessed it—all morning long squirrels ran up and down that fallen tree, stopping frequently to preen or gnaw an acorn within reach of a well-placed arrow. This year I won't have to think twice about where to take my bow for squirrels.



***Small-game** bowhunters have a wide array of arrowheads from which to choose. Unlike the razor-bladed broadheads used for deer, small-game arrowheads dispatch rabbits and squirrels by their powerful punch and shock effect. The wire's protruding from the tip also keep arrows from burying in the ground, making retrieval easier.*

Look to your own hunting experience for new twists on old themes. Remember all those squirrels you saw while floating for ducks last year? Try wading small streams with bow in hand, ready to ambush early morning bushy-tails on their way for a drink. For rabbits, I rely again on tricks of the trade learned as a kid. Before Tim Lassiter and I could afford shotguns or rabbit hounds we enjoyed no small degree of success by team hunting rabbits with bow and arrow. After finding a thicket or woodsedge where rabbits were numerous, we'd spread out some 30 feet apart and quietly stalk through the cover. Inevitably we'd kick up a cottontail or two, and one of us would circle in the direction of the retreat. We'd put a silent squeeze on the rabbit, and often one of us would wind up with a solid shot.

And if you ever tire of rabbits and squirrels and the occasional groundhog or two, turn to my friend Bennett Wilder for inspiration. Bennett keeps his bowhunting skills sharp 'round the calendar. Months before deer season begins he has his bow in hand, stalking bowfin and carp in Piedmont lakes and streams. And for a few weeks in winter he stalks the ultimate quarry: flying game.

"Some of my friends told me you couldn't kill a swan with a bow," he told me recently. "But I know you can." To try to prove it, Bennett has taken his compound bow to soybean fields in eastern North Carolina for the last two swan seasons. He's yet to take a swan with a bow, but he's learned enough about the game to feel confident about his chances this year.

"The first year so many came in I got excited and picked up my gun," he said, noting that he had some 400 plastic-bag decoys set out. "This year I'm going to set out a smaller set of decoys—maybe just 50 or so. And I'm taking at least two dozen flu flu arrows tipped with broadheads. Last year I passed up a lot of shots, so it's better to have a lot of arrows on hand."

Bennett shoots instinctively, with no bowsight, and he says the key is learning to draw, aim and lead in one motion. "It takes a while to get the hang of it. I haven't knocked any feathers off one yet," Bennett admitted, "but I've come so close to a few that they turned their heads to look at the arrows go by."

There you go: inspiration. But the budding small-game bowman won't have to tackle a flying target to test his mettle in this game of fist-sized targets. Believe me, a schizophrenic squirrel with Gale Sayers footwork will be inspiration enough.

"Sea Biscuit," last year's tourney winner (above), trolls for marlin in the Gulf Stream. On Steve Stroud's "Andrea Grace III," (right), anglers Bill Palmer, Pete Owens and Eric Stroud rig baits and work on tackle. Palmer tends a line while waiting for a strike (top, right).

FISHING FOR DUCKS

Ducks Unlimited's annual "Band The Billfish" Tournament is aiding marine research, and it's also raising thousands of dollars for waterfowl restoration.

written by Jim Dean
photographed by Ken Taylor

What do ducks have in common with blue marlin? Quite a bit, it turns out. This past August, anglers skipping baits behind small boats on the blue waters of the Gulf Stream had both species in mind. They were raising money to improve waterfowl nesting and wintering habitat, and also tagging billfish to aid in research. It was all part of the second annual "Band The Billfish" Tournament sponsored by N.C. Ducks Unlimited and held this past August 9-11 at Morehead City and Atlantic Beach out of the Seawater Marina.

By all accounts, it was a great success. The event attracted 51 boats (23 more than last year) and raised approximately $50,000 ($11,500 more than last year). "We will make 80 percent of that money available to waterfowl projects in North Carolina such as the MARSH (Matching Aid To Restore State Habitat) program," said Lloyd Goode, tournament chairman. "Through an agreement with the N.C. Wildlife Resources Commission, that $40,000 will be matched by an equal amount to be applied to in-state waterfowl habitat projects. The remaining 20 percent we raised will go to Ducks Unlimited National for use in wetland projects in North America."

Boats in the tourney caught 10 blue marlin, tagging and releasing nine. Howard Brooks, DU state chairman from Tennessee, caught the largest blue marlin, a 738-pounder, while fishing on the *Patricia Ann*. Nine white marlin and two sailfish were also tagged and released. Darrell Morgan's boat, the *Sea Merchant*, was the overall tournament winner with two tagged blue marlin.

"We've had rave reviews from those who participated," said Goode. "Everyone had a lot of fun, and the competition isn't too intense. We had DU volunteers on each boat taking part in a photo contest, and the results provided a lot of laughs. But everyone especially liked the idea that they were contributing to helping waterfowl and billfish. The tags were supplied by the National Marine Fisheries Service, and the size, length and location of each billfish catch was recorded."

The third annual "Band The Billfish" Tournament will be held next August 8-10 at Morehead City and Atlantic Beach, and entries who sign up before August 1 will be eligible for special early-bird drawings for prizes.

Restoration Under Way at Mattamuskeet

Historic Lodge Needs Funds, Tenants, Renovation

Written and Edited by Vic Venters

Wanted: responsible tenants for former hunting lodge. Lakefront location, unmatched scenery, unparalleled view. Suitable for conferences, research center, retreat or museum. Renovation required, deep pockets helpful.

If the U.S. Fish and Wildlife Service were in the business of running want ads, their entry to restore the vacant lodge building at Mattamuskeet National Wildlife Refuge might read something like that. Want ads or not, the Service and others are looking for partners to renovate one of the most beautiful and historic buildings in northeastern North Carolina.

Towering above the 50,000-acre lake and refuge, the building was originally constructed as a pumping station to drain Lake Mattamuskeet for conversion to farmland in 1913. Wet weather and unreliable pumps eventually killed the project, and in 1934 the lake bed was sold to the federal government. The lake was converted to a national wildlife refuge, allowed to refill, and the 5,000-square-foot building was refurbished as a hunting lodge. The distinguishing feature of the building — its 120-foot-tall chimney — was converted to an observation tower.

Up to 130,000 geese wintered at the refuge each year, and from the late 1930s to the 1960s, Mattamuskeet was hailed as the "goose hunting capital of the world." By the late 1960s, however, geese were beginning to winter farther north, and hunting declined. In 1974, the private concession that operated the lodge closed its doors. The building has stood empty since.

Although placed on the National Register of Historic Places, time and 15 years of vacancy have taken a toll. Windows are broken, and the Spanish tile roof and masonry have cracked, allowing water seepage and damage. "It's gotten to the point where we need to step in and do something," said Don Temple, refuge manager for Mattamuskeet.

Fortunately, there is considerable interest in restoring the lodge. Last year, a study conducted by the Regional Development Institute of East Carolina University concluded that the building had excellent potential for rehabilitation. The State of North Carolina has expressed interest in leasing space for appropriate agencies or for use as a research center, and local legislators have sponsored a bill in the General Assembly to study the renovation efforts.

Currently, the Fish and Wildlife Service is seeking a tenant for the building. "Our position is that we are actively seeking some organization or individual willing to lease it and put the building into a compatible use for the refuge," Temple explained. "It would be great to lease it as an environmental center to a conservation organization. Another possibility would be to relocate our office over there, establish a visitor's center and a museum. Also, it could be leased for office space for public or private agencies or could become a conference or retreat center."

Clearly, the interest is there but the sticking point will be, predictably, money. Funds are tight at both the state and federal levels. Temple estimated that it will cost $100,000 to stabilize the building, and at least $1.5 million to fully restore it. Although funds are short, the Service has begun limited work to contain the damage, Temple said.

A private committee, Friends of Mattamuskeet Lodge, has also been formed to help with restoration efforts and to lobby funds from private and public sources. The committee is off to a good start, according to Temple. Its first project was to sponsor a cleanup day at the lodge last July. Over 150 people turned out for a resounding success. "As a public employee, I left work that day feeling as good about working with the public as I ever have," Temple said. "It was a rewarding experience."

For more information on restoration efforts, contact Don Temple, Refuge Manager, Mattamuskeet National Wildlife Refuge, Route 1, Swan Quarter, N.C. 27885, or call (919) 926-4021.

KEN TAYLOR

Matron of Mattamuskeet: *The grand old hunting lodge at Mattamuskeet was originally built as a pumping station to drain the lake in 1913. Vacant since 1974, the lodge is in need of repair and renovation.*

Bobwhites Increased in Piedmont

Hunting Surveys Track Quail, Grouse Populations

Last year's results from the Avid Hunter Surveys for ruffed grouse and bobwhite quail produced a mixed bag for upland bird hunters in North Carolina. The good news is that ruffed grouse populations continued to climb in the mountains, while bobwhite showed some scattered improvement statewide, though quail populations remained depressed overall.

The 1989-90 Avid Grouse Hunter Survey tracked the results of 80 hunters over 1,250 hunts, while the Avid Quail Hunter Survey was based on results gathered from 173 hunters over 3,276 hunts.

Measured by the previous season's harvest data, grouse populations increased. Statewide, average flush and harvest rates were higher than previously reported since the survey began in 1984. Population gains were especially noticeable in the northern mountain counties. Twelve counties reported an increase in the flushes per hour per individual, while only one county showed a decrease in flushes.

The average grouse harvest per season per party jumped from 10.5 birds to 14.4, while the average flushes per trip per party increased from 5 to 6.3.

The best news regarding quail was that the 1989-90 season was not as bad as the dismal 1988-89 season. The 1988-89 season was the worst quail hunting season on record since the Avid Quail Hunter Survey began in 1984, with numbers of coveys flushed and quail bagged down sharply.

By contrast, last year in the Piedmont there was a modest population gain. There, hunting parties flushed an average of 1.9 coveys per trip, up 40 percent from the preceding year. In the Coastal Plain, hunters flushed 3.15 coveys per trip, up about 6 percent. The average number of quail bagged per party per trip in the Piedmont was 2.81, up almost 37 percent. In the Coastal Plain, however, the average bag actually dropped about 3 percent to 5 birds per party per outing.

NC WILDLIFE RESOURCES COMMISSION

Steady: *Last year's results from the Avid Grouse and Quail Hunter Surveys showed a good increase in grouse populations in the mountains, while quail populations increased in the Piedmont and were stable in the Coastal Plain. Overall, however, bobwhite populations remain depressed.*

"Last year was the first glimmer of optimism for bobwhite we've had in the Piedmont," said Terry Sharpe, the small-game project leader for the N.C. Wildlife Resources Commission. "Populations are still way down but there was an improvement. In the Coastal Plain, there wasn't much change from the year before on the average. In some counties populations were up; others were down. So it basically averaged out over the region."

Sharpe attributes last year's upturn to better weather. "I believe it's because of more rain the previous summer," Sharpe said. "Before that, we had several years of bad summer droughts. Sustained hot dry weather reduces the supply of insects that form a critical part of a young bird's diet."

Wildlife biologists have not been able to pinpoint all the factors involved in the long-term declines affecting bobwhite populations over the past several decades, although habitat destruction and changing agricultural practices are prime suspects. Weather factors such as drought and prolonged cold snaps are also believed to influence short-term population fluctuations.

Sharpe said that last December's frigid winter storm did not significantly hurt quail populations in the Coastal Plain. "From the data we've got, it shows that populations were low right from the beginning of the season in November," he said. "So I don't think that storm had a big effect on the birds."

And what prospects might quail hunters expect for the upcoming season? "I'm not too pessimistic," Sharpe said. "The weather wasn't perfect, but it was fairly good."

"However," he added, "we've still got these old nagging habitat problems."

Set for N.C. State Fairgrounds

Wildlife Federation Holds Art Show

Raleigh will play host to the 22nd annual North Carolina Wildlife Art Exhibition & Sale to be held December 7-9 at the Kerr Scott exhibition hall at the N.C. State Fairgrounds. The show is sponsored by the N.C. Wildlife Federation and the N.C. Nature Artists Association and features the work of award-winning national and local wildlife artists, sculptors and carvers.

Proceeds from the show help fund the Federation's continuing conservation education programs. The N.C. Wildlife Art Exhibition & Sale has grown in recent years from a small, local show to become one of the largest East Coast exhibits outside of the major shows in Easton, Md., and Charleston, S.C.

Nationally recognized artists will staff booths or be represented by galleries that show and sell their originals and prints. Admission is $3 for adults and free for children under 12. For advance tickets or for more information, call the N.C. Wildlife Federation at (919) 833-1923.

Commission Surveys Chowan River

Do Tournaments Hurt Bass Populations?

During peak fishing season, the Chowan River in northeastern North Carolina gets fished pretty hard by bass tournament anglers. So hard, in fact, that fisheries biologists with the Wildlife Resources Commission have wondered how the river's fishery is holding up under increasing angling pressure.

There's good news, however, for both the bass in the river and the fishermen who catch them. A recent research project conducted on the Chowan by the Wildlife Commission shows a good distribution of bass across the normal age and size range. "As far as we can tell right now, the river is not being overfished," said Pete Kornegay, fisheries biologist for the Wildlife Commission. "We found a lot of young-of-the-year fish, indicating good reproduction. We also saw what you would expect to see in older fish."

About 420 bass were electroshocked and collected over a three-week period this summer. They were weighed and measured before being released. "We were concerned for two reasons," Kornegay elaborated. "During fishing season, there are typically four or five bass fishing tournaments every weekend. All of these tournaments now practice catch-and-release, but there is always a certain amount of tournament mortality. We were worried that the cumulative mortality from successive tournaments might be adding up." Tournament mortality typically ranges from 5 to 10 percent but can be considerably higher, depending on water temperature, heat and how the fish are handled.

The practice of culling fish during these tournaments is also a concern, Kornegay added. A fisherman catches and releases fish all day, retaining only the limit of larger fish for the tournament weigh-in. "If you add mortality from the fish initially culled to those released after the tournament, it could become an additive factor," he said.

Fortunately, the project discounted those concerns. "One thing that has helped is that anglers are handling the fish to be released better these days," Kornegay said. "It's good to see that people are aware of their responsibility."

The electroshocking turned up some big bass, he added. "We collected one over 9 pounds, a couple over 8 pounds and several 7-pounders."

JIM DEAN

Bass Busters: *A survey performed last summer by Wildlife Commission biologists on the Chowan River showed that heavy tournament fishing pressure was not affecting bass populations in the river. Increased catch-and-release ethics and better handling of fish are maintaining populations, biologists say.*

Field Notes

Season openings, closings and regulation changes.

Eastern Gun Deer	Open through Jan. 1
Central Bow and Arrow Deer	Closes Nov. 3
Central Muzzleloading Deer	Nov. 5 - Nov. 10
Central Gun Deer	Nov. 12 - Jan. 1
Northwestern Bow and Arrow	Closes Nov. 10
Northwestern Muzzleloading Deer	Nov. 12 - 17
Northwestern Gun Deer	Nov. 19 - Dec. 1
Western Bow and Arrow Deer	Closes Nov. 17
Western Gun Deer	Nov. 19 - Dec. 8
Bear	See *Regulations Digest*
Wild Boar	Early season open through Nov. 17
Gray Squirrel	Open through Jan. 31
Fox Squirrel	See *Regulations Digest*
Rabbit	Nov. 17 - Feb. 28
Bobwhite Quail	Nov. 17 - Feb. 28
Ruffed Grouse	Open through Feb. 28
Raccoon and Opossum	See *Regulations Digest*
Rail, Moorhen and Gallinule	Open through Nov. 9
Common Snipe	Nov. 14 - Feb. 28
Mourning Dove	Nov. 20 - Nov. 24 (middle season)
Duck, Merganser and Coot	Nov. 22 - Nov. 24 (middle season)
Sea Duck	Open through Jan. 15
Snow Goose	Nov. 3 - Jan. 31
Brant	Nov. 22 - Nov. 24 (middle season)
Swan (by permit only)	Nov. 3 - Jan. 31

Check the *Regulations Digest* for information on season boundaries, bag limits and other regulations. Copies of waterfowl regulations are also available from license agents.

The areas in which hunters will be required to use nontoxic shot this year include Beaufort, Bertie, Carteret, Chowan, Craven, Currituck, Dare, Hyde, New Hanover, Pamlico, Pasquotank, Robeson and Washington counties; Butner-Falls of the Neuse Game Land, New Hope Game Land and all posted waterfowl impoundments on Game Lands.

Development Not Only Problem

Logging Also Threatens New River

Dear Editors:

Thank you for publishing the article "Old River, New Trouble" (August 1990). Both the history and current state of affairs have been put forward most effectively in the article.

To completely reflect the current state of affairs, it could have been said that agricultural runoff and sedimentation from timbering operations have also spoiled and polluted the New, just as the developers have done. It is ironic and a poor reflection of public policy in North Carolina that the state's Sedimentation Pollution Control Act regulates developers but not the timber industry.

Sedimentation inspectors are often frustrated when visiting development sites to work on lesser problems associated with new subdivision roads while gullies and severe erosion caused by clear-cutting and logging roads on nearby land go unchecked and unregulated.

As a volunteer and second president of the National Committee for the New River, I have been disappointed that efforts to secure scenic easements and other measures to protect the New have come to so little. We have tried many approaches without success, but we will keep on trying. Meanwhile, awareness through publications such as yours is very much appreciated.

Edmund I. Adams, Attorney
Sparta

If you'd like to share any unusual stories about wildlife or comment on the magazine or conservation issues, let's hear from you. Letters should be 150 words or less. We reserve the right to edit any correspondence. Please send to Letters Dept., Wildlife In North Carolina, *512 N. Salisbury St., Raleigh, N.C. 27604-1188*

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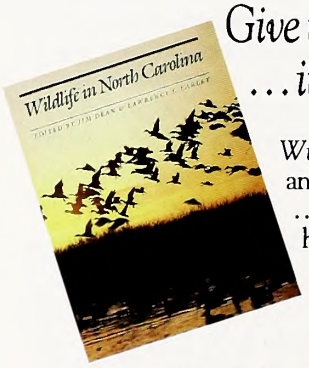
Calendar

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before traveling to an event. Listings for calendar should be sent at least four months in advance.

Nov. 10
Fall meeting for the N.C. Herpetological Society will be held on the N.C. State University campus in Raleigh. Anyone interested in reptiles and amphibians is welcome to attend. For more information, contact the N.C. Herpetological Society, N.C. State Museum of Natural Sciences, P.O. Box 27647, Raleigh, N.C. 27611, or call (919) 733-7450.

Nov. 17-18
The Wildlife Rehabilitators of North Carolina will hold a fall conference in Asheboro. All licensed rehabilitators are welcome to attend. For more information, write Wildlife Rehabilitators of North Carolina, P.O. Box 152, Whitsett, N.C. 27377-0152.



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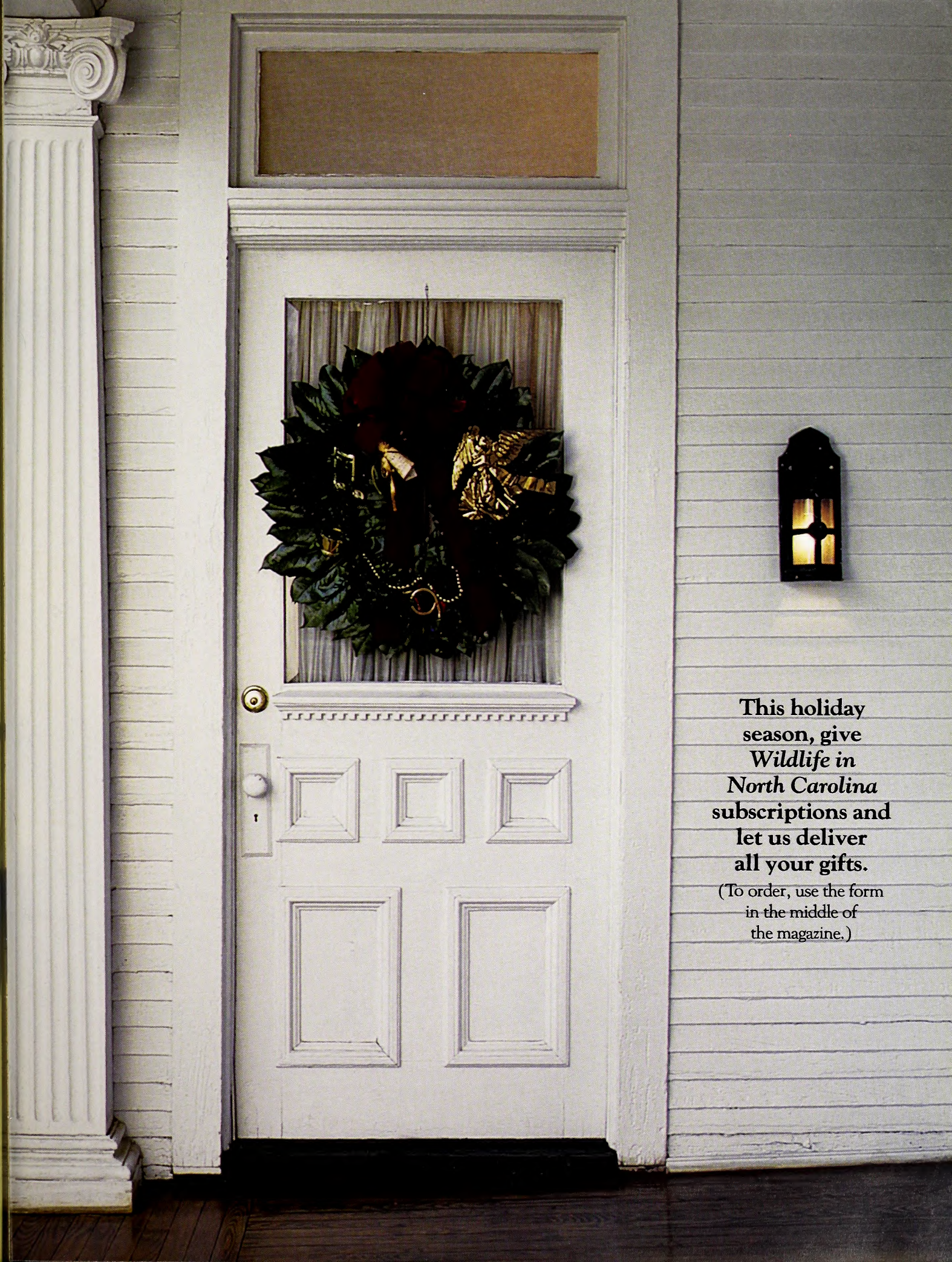

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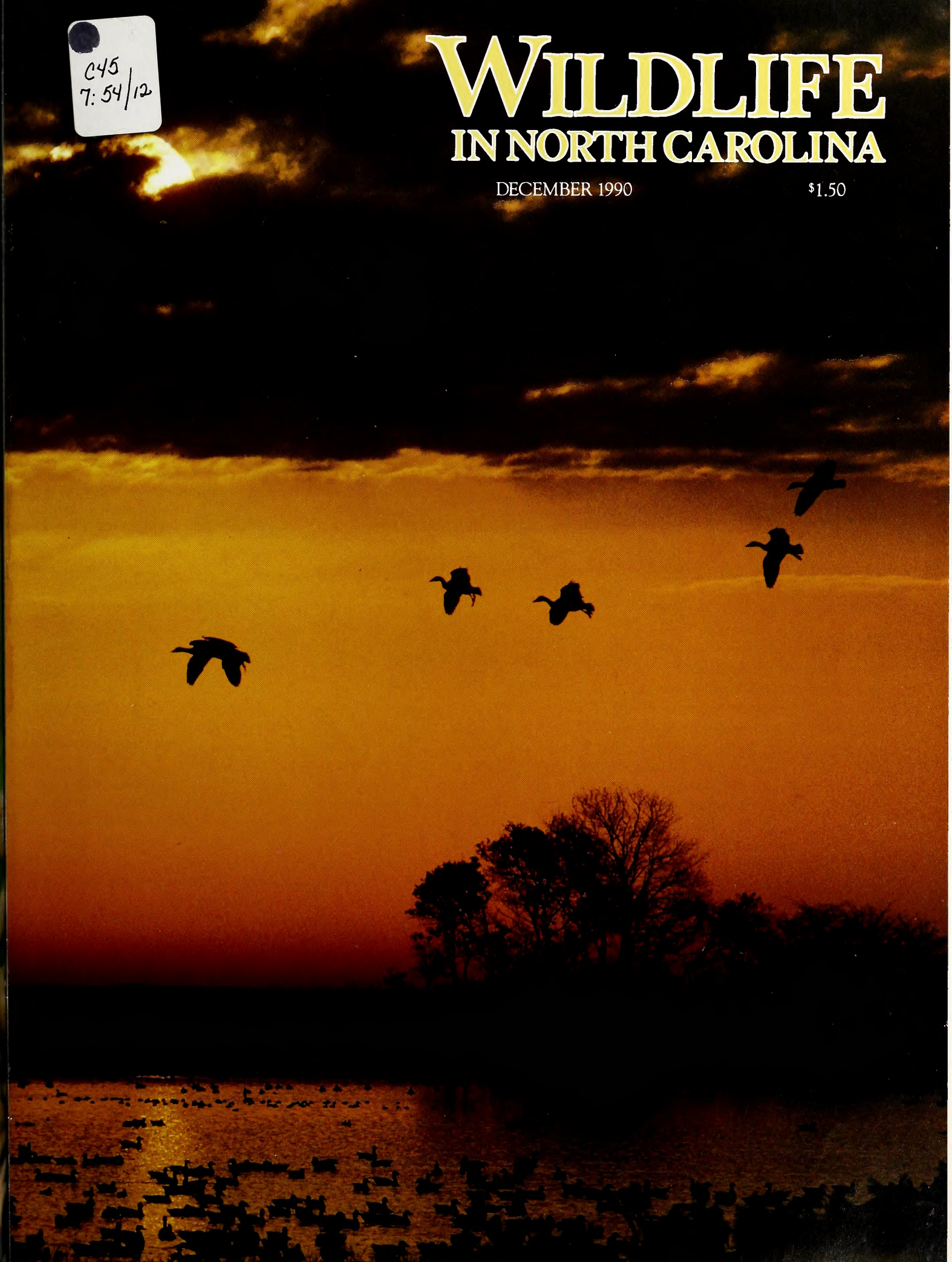
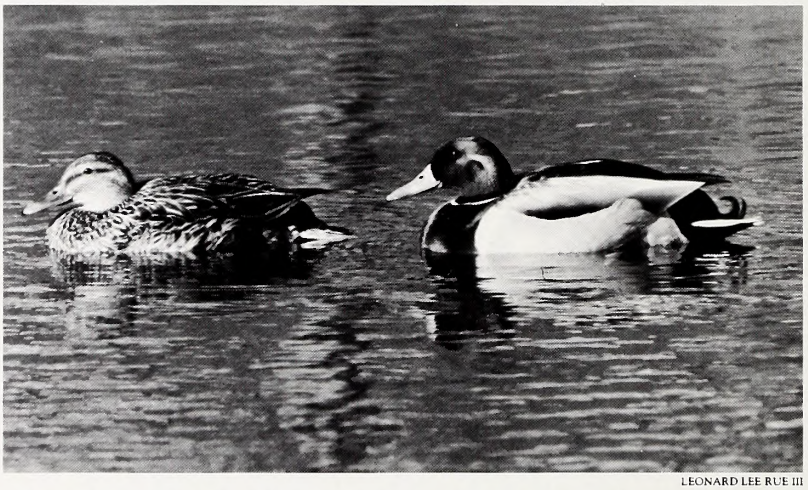


What To Do About Ducks

by Jim Dean

Next to a busy four-lane artery through Raleigh, someone has momentarily failed to fill and pave a tiny remnant of freshwater marsh, an oversight that will surely be remedied soon. Meanwhile, it serves as a sort of daily emotional elixer for those of us who dare tear our eyes off the road for a passing glance. I don't know how many others have noticed it, but I've seen a few drivers crane their necks for a quick glimpse of the modest miracle that occurs there each winter.

Screened by a row of trees, the marsh is visible only after the leaves fall. From then until spring, the clumps of reeds and grass turn gold in the afternoon sun, and the still water becomes a wavering mirror reflecting the gaunt tree trunks on the opposite shore. On some days, skim ice forms, and after one heavy ice storm, the marsh was a glittering fairyland.



LEONARD LEE RUE III

It's a scene that needs only a few ducks to make it complete, and, glory of glories, for at least the past three winters a pair of mallards has arrived each fall to spend the winter feasting on submerged vegetation. How they found this little oasis is a mystery, but it gladdens the heart to see them dabbling and preening, apparently oblivious to the clamor around them. Several times, I've seen them fly over the highway, set their wings and glide into their urban paradise. Seeing those ducks has been the best part of numerous gloomy days.

Our greenhead friend and his spouse have had their share of homeowners' woes. One year, someone tried to drain the marsh by cutting a ditch into a nearby creek. It was successful until silt from an adjacent construction site clogged the ditch and the marsh partially refilled. The silt has also filled parts of the marsh, cutting down on the tasty vegetation and backing the ducks into a more remote corner where they're more difficult to spot.

It takes no stretch of imagination to view the uncertain future of these mallards as symbolic of what's happening to waterfowl throughout North America. Waterfowl populations have plummeted over the past few decades, and some species are at an all-time low. By far, the major culprit is loss of prime breeding grounds to development in the upper midwestern states and Canadian plains combined with a series of severe droughts on the breeding areas that remain. Ducks also encounter problems when they migrate to their southern wintering grounds only to find that the habitat has been changed or, in some cases, destroyed. The noose has tightened everywhere.

Regulated hunting isn't — or shouldn't be — much of a factor since it's designed to permit the harvest of only an excess (by substituting gun mortality for another form of mortality that would occur naturally anyway). Still, there are hunters who believe the regulations need more adjustment — that we're taking deeper bites than we should, nibbling into the critical core of the breeding population.

Waterfowl hunters, of course, have a vested interest in the welfare of waterfowl, and they're frankly worried. They support the North American Waterfowl Management Plan (NAWMP) that was signed in 1986 linking the United States and Canada in a common goal to restore duck and goose populations to the levels that existed in the early 1970s. This plan holds much promise, as do efforts by individual states and private groups to restore wintering habitat (see "Waterfowl on the Home Front" in this issue). Through it all, Ducks Unlimited has continued its vital protection and restoration of prime breeding grounds, a goal many believe is the real key. If these efforts continue to gain momentum, the outlook will be brighter than in recent years.

Even so, many individuals feel a bit helpless. If so, here are a few things you can do that will help.

— Buy a Federal duck stamp ($12) and a North Carolina duck stamp ($5) each year even if you don't hunt. Federal stamp money goes directly to the purchase of waterfowl refuges, while state funds enhance wintering habitat and similar projects.

— Contribute to Ducks Unlimited. This well-respected private organization puts money where it counts most, especially into protecting waterfowl breeding areas.

— Keep track of the NAWMP, and support its goals if you see the plan coming under attack. You can get more information about it by writing: North American Waterfowl Management Plan, U.S. Fish & Wildlife Service, 880-ARLSQ, 1849 C St NW, Washington, D.C. 24240.

— Pass up some shots for a few years. Some hunters are shooting only drakes, calling birds in just to watch them, or spending part of their trip hunting with a camera. Others have been cutting down on their trips, some even passing up an entire season.

So what about that little inner city marsh? Perhaps it's in a floodplain restricted against development, and may even belong to the city. If so, perhaps it could be established as a natural area. It's worth an inquiry, and I know a couple of mallards that would be interested in a long-term lease.

December 1990
Volume 54, Number 12

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WILDLIFE IN NORTH CAROLINA

Wildlife in North Carolina is the official educational publication of the North Carolina Wildlife Resources Commission, and is dedicated to the sound conservation of the State's wildlife and other interrelated natural resources and the environment we share with them.

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Cover *Snow geese join other geese, swans and ducks to enjoy the glow of a Mattamuskeet sunset. Photograph by Gene Hester.*

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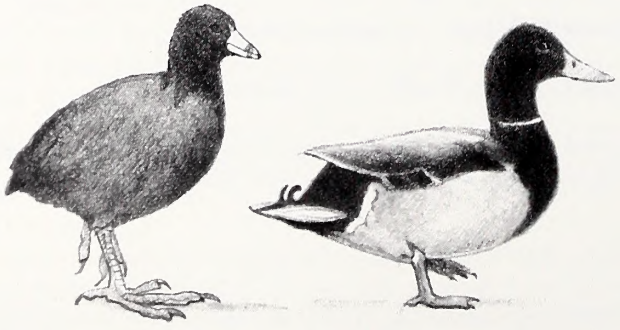
Coots are often seen *in winter on freshwater lakes and brackish water sounds in North Carolina. As members of the rail family, coots share some common characteristics with rails and gallinules. All prefer marshy habitats, although coots like more open water and are the most aquatic of the three. Some rails have a longer bill adapted to probing for food in mud, while gallinules and coots have shorter bills adapted to taking food from the water surface.*



Though they may seem *like waterfowl, coots and ducks are very different. Ducks have webbed feet, while coots' toes are separate, although they have fleshy lobes that help propel them under water. Ducks' bills are flatter than coots', enabling them to strain food from the water.*

breeding range

winter range

Coots nest *primarily in the prairie pothole region of the northcentral United States and the southern Canadian provinces of Saskatchewan and Manitoba. They lay 8-10 eggs in nests attached to clumps of reeds on open water. They winter as far south as South America and the Caribbean.*

Crazy as a Coot

written by Lawrence S. Earley / illustrated by David Williams

When it comes to getting airborne, water birds have adopted a variety of strategies. A dabbling duck like a mallard explodes directly into the air as if it were bouncing off a trampoline. A diving duck like a canvasback is larger and needs to taxi a bit along the water surface before it achieves flight.

Then there's the coot, or the "blue peter," as some old-timers still call it. This is a bird that seems to require a list of good reasons to want to fly at all. Naturalist Thomas Pearson noted that in a journey down Currituck Sound in 1902, a half-mile raft of coots didn't flush when his little steamer approached. They merely parted into two groups of swimmers and his little steamer passed through without causing a fuss.

But when there's no way to avoid it, and they positively have to fly, coots seem to splash forever along the top of the water before laboring into the blue. Why don't they fly like a duck?

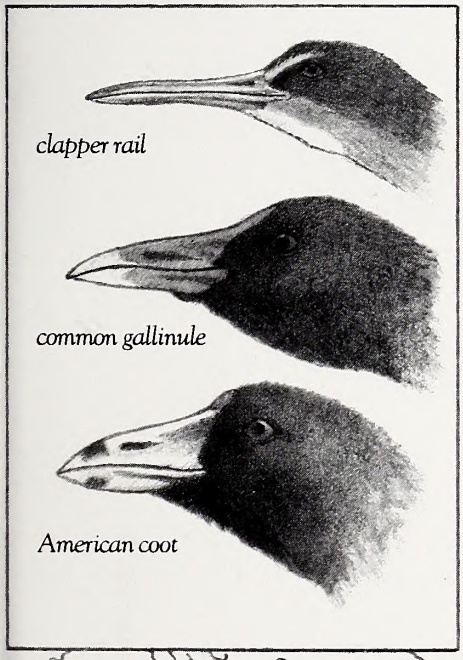
Well, for one thing, coots aren't ducks — or geese or swans or any other type of waterfowl. Along with rails and gallinules, they are members of the rail family (Rallidae), all of them small birds that prefer marsh habitats and tend to be somewhat shy.

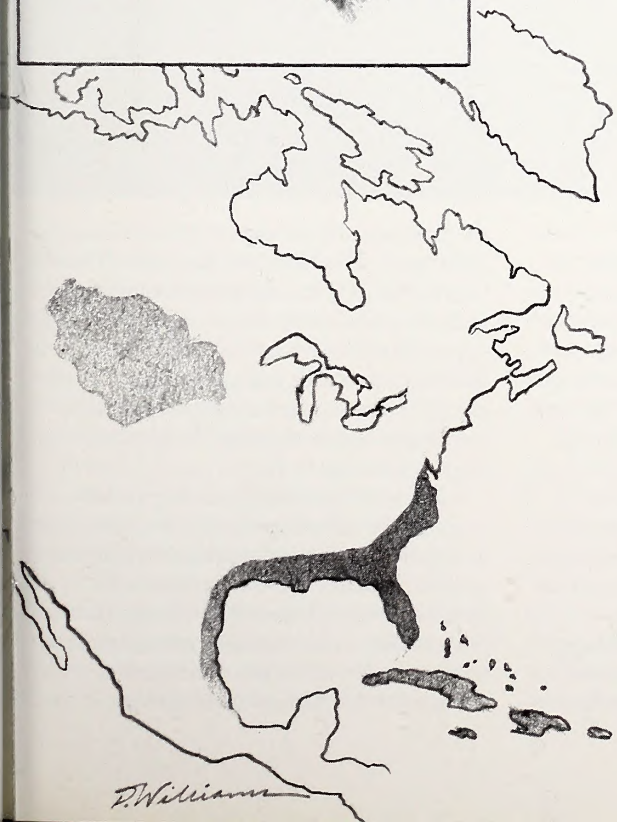
Yet, coots vary in other ways from their rail cousins. Whereas gallinules and rails are strictly marsh birds and are most often solitary, North Carolinians most often see coots in open water and in the company of their kind. Coots are much more of an aquatic species than either rails or gallinules. They are accomplished divers, equipped with fleshy lobes on their toes that give them additional propulsion in the water. They dine on underwater grasses, but feed mostly on the surface, looking for pondweed, sedges, grasses, seeds and algae along with seasonal treats of aquatic insects. Young coots are fed insects almost exclusively until their intestines are developed enough to digest vegetation.

Coots are only about 13 to 16 inches long. They are dark gray birds with a darker head and a white bill with a curious ornamentation, called a frontal shield, that extends from their upper bill and covers their foreheads. Scientists have observed that coots in the Carribean Sea have larger frontal shields than others and that coots with larger shields tend to be dominant in the flock, but their exact function is unknown.

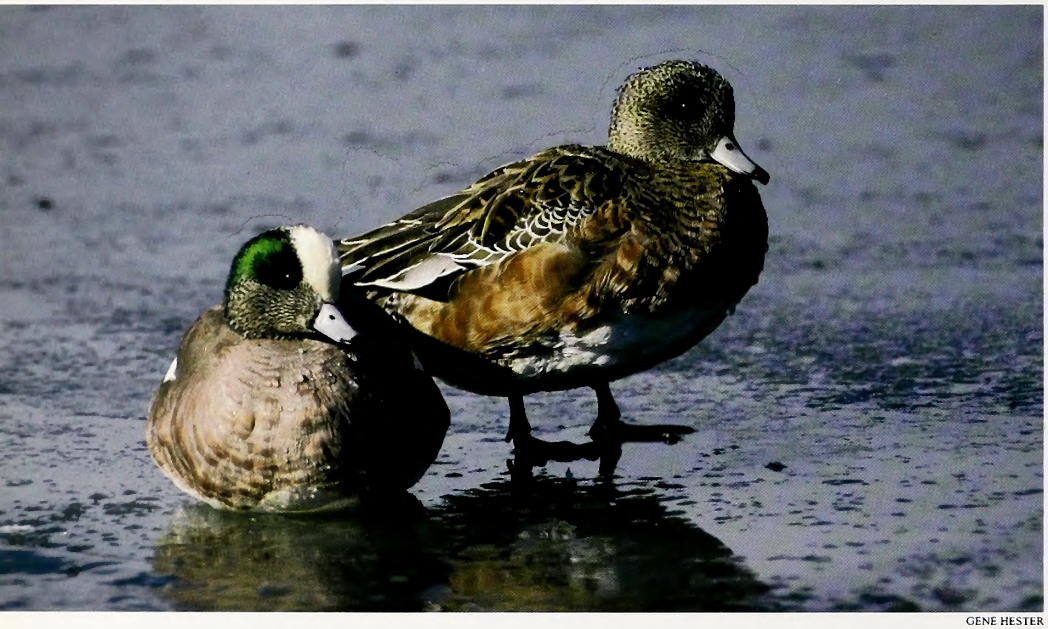
Coots' aversion to flight may be one reason why they are pretty safe during the hunting season in North Carolina. Though there is a season and bag limit for coots, gunners have never pursued coots as avidly as they have ducks, geese and swans. Some say they are just too stupid to hunt, while others, perhaps more kindly, explain that coots are ungainly and slow in the air and lack the kind of wariness that hunters appreciate in quarry. On one lake in Illinois in the 1940s, 90 percent of the coots were taken in a single day!

Yet looks are deceiving. Though they may seem unskilled aerialists, coots migrate long distances, and all of it by night. Although a few have been known to nest in the Carolinas, most coots breed thousands of miles away, in the prairie pothole country of the American Dakotas and the Canadian provinces of Manitoba and Saskatchewan. After their young are fledged at the end of the summer, they begin their long flight south to their wintering grounds, arriving in North Carolina sometime in September and remaining as late as May.





THE DUCK STOPS HERE



GENE HESTER

From Labrador across the Canadian Plains to Alaska, ducks and geese head south each winter, but the migration routes they follow are far more complicated than once thought.

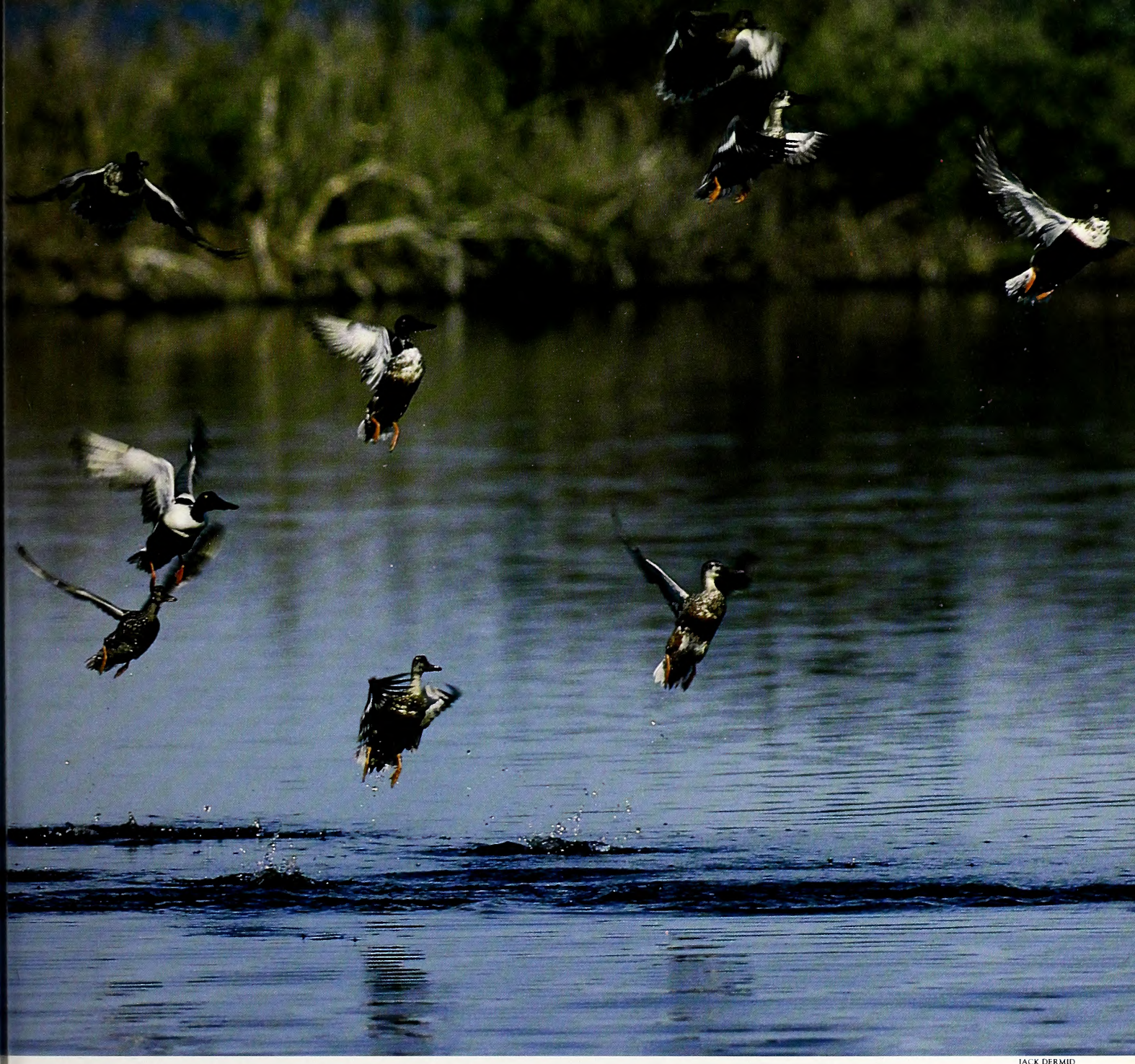
by Dennis Luszcz

A family of tundra swans glides quietly across a still pond in the Yukon River Delta. Several thousand miles to the east, on the west coast of Baffin Island, a pair of greater snow geese watch over their young as they avidly probe for tubers of marsh plants in the tidal mud. A small flock of Canada geese, having left their nesting areas on the northern Quebec coast a week before, loafs in a river mouth on James Bay. It is late-September and already the specter of approaching winter hangs heavily over the arctic fringe of North America.

Simultaneously, on a cattail-fringed pothole near Brandon, Manitoba, a male canvasback surfaces, its bill crammed with succulent wild celery. A nearby pintail, perched on a muskrat mound, preens flight feathers only a few weeks old. In another time zone, a little group of black ducks, a pair of green-winged teal, and a lone hooded merganser disturb the red and yellow leaf-flecked surface of a remote Vermont beaver pond. Even at these more southern latitudes skim ice has formed in the shallows on cooler mornings.

These birds are found in far-flung locations, but they all have something in common. They will soon begin flights that will take them to some of our familiar North Carolina waterfowl habitats for the winter. These migrations are often along different paths and may include non-stop travel of over a thousand miles or many stopovers enroute. Weather conditions and availability of food along the way may either delay or stimulate movement of waterfowl but the urge to migrate is strong.

Migration is an adaptation that permits birds to take advantage of food resources that would otherwise be unavailable to them and enables them to avoid competition with resident species. They can escape the darkness and ice of the north by moving to more temperate climates where they can find open water and food. After exploiting these



JACK DERMID

***Recently arrived** from a grueling migration, these Northern shovelers (above) would like to find a quiet spot they don't have to leave so quickly. Except for some resident wood ducks, most waterfowl species that winter in North Carolina, like shovelers and this pair of widgeon (opposite page), are born in the far North.*

resources, they can return to their nesting areas in prime condition and ready to breed. The northern breeding areas offer habitats rich in insects for rapidly growing ducklings and goslings and, in the northernmost areas, relative freedom from ground predators. The birds can also avoid the summer heat and humidity in their former winter quarters.

Waterfowl have a tendency to return to the same nesting areas year after year. Lyle Sowls made observations on 152 nesting puddle ducks in Manitoba and found that about 27 percent returned to the same area the next year. One shoveler hen returned to the same 75-acre meadow in four consecutive years. When you consider that only slightly over 50 percent of ducks survive from one year to the next, this percentage becomes more impressive. Wood duck hens often return to the same nest box again and again and here in North Carolina, many landowners report resident Canada geese nesting repeatedly in the same locations. Many of these geese are repeat nesters.

This homing tendency is beneficial to the species because good nest sites, those that tend to be free from predation, are used repeatedly. Birds that do not home to a previous nesting site — often the younger hens — tend to pioneer into new areas. This facilitates the occupation of new nesting habitats and range expansion.

Once waterfowl begin to leave their nesting areas, their migrations may follow many pat-

NATIONAL DUCKS UNLIMITED

***This handsome drake** canvasback (right) began life as a ball of yellow fluff (above) in Alaska or on the prime breeding grounds of the north-central plains. Canvasbacks that migrate to wintering grounds in North Carolina take a circuitous route, most likely to the upper Mississippi River, then east across Pennsylvania, and finally down the East Coast.*

GENE HESTER

terns. The designation of flyways used in the development of waterfowl-hunting regulations is an overly simplified approach. In this system the North American continent has been divided from east to west into four generalized migratory routes or flyways for administrative purposes: the Atlantic, the Mississippi, the Central and the Pacific. The Atlantic, which includes North Carolina, consists of all of the 17 easternmost states, Puerto Rico, and six eastern Canadian provinces. The flyways are generally based on biological realities but many exceptions exist. An actual map of migration routes moving through or terminating in North Carolina would resemble an intricate web of pathways with nearly as much movement east and west across the continent as north and south.

The tundra swan pair that raised their young in the Yukon River Delta country is faced with a trip of over 5,000 miles that will take them across all four of the administrative flyways. They may stop at major staging areas on the Athabasca River in Alberta and then to Freezout Lake, Montana, or Whitewater Lake, Manitoba. From North Dakota, their route turns easterly to the Chesapeake Bay with a few possible stops enroute. They then move southward, with most arriving in North Carolina by December.

The Manitoba canvasback and the pintail must also make similar, although shorter, cross-flyway flights. The canvasback probably will head southeastward stopping on the Mississippi River navigation pools in either Wisconsin or Iowa by late-October. When it leaves the Mississippi a couple of weeks later it will head eastward to the Chesapeake and North Carolina with a possible brief stop at either Lake St. Clair near Detroit or Long Point on Lake Erie.

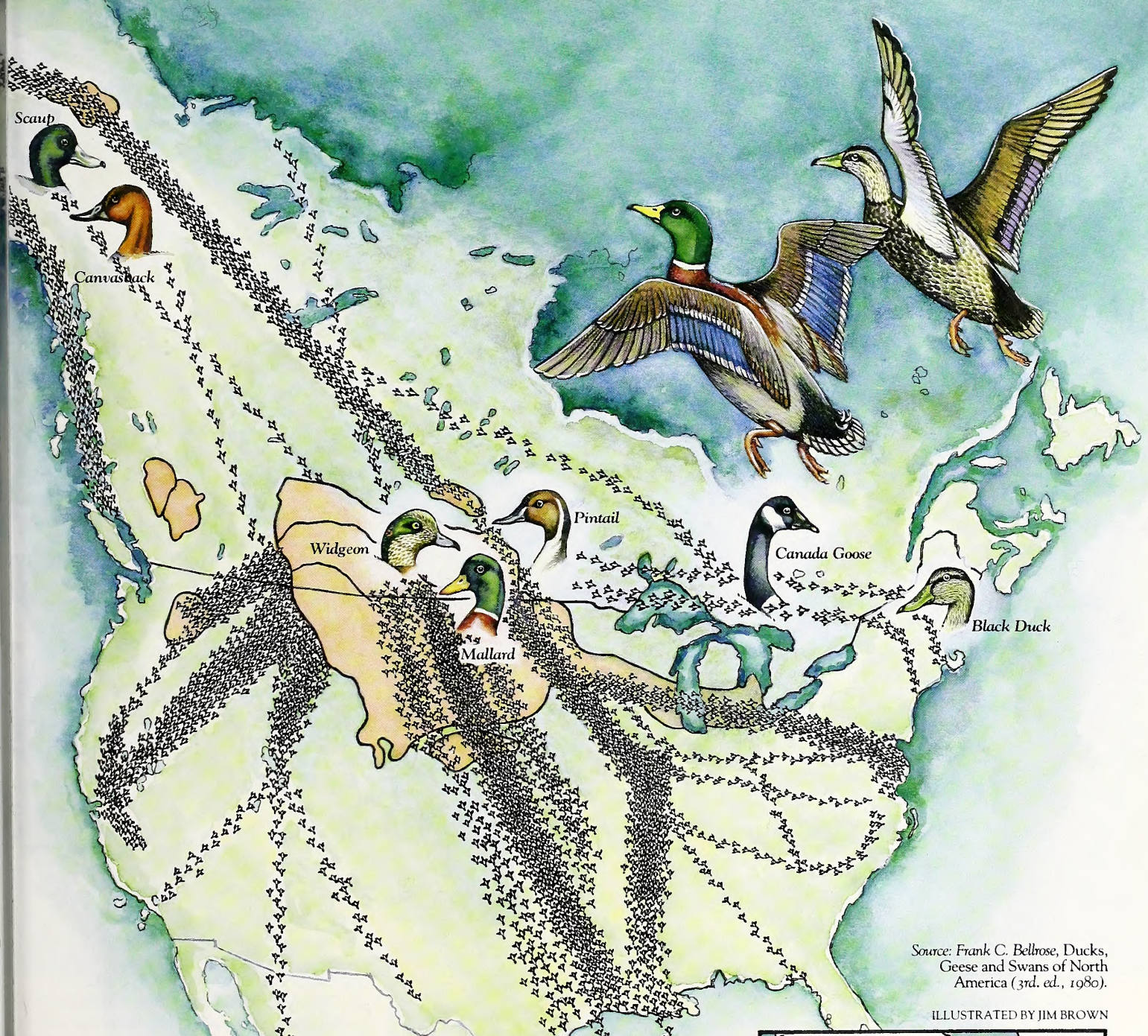
The pintail's migration to our area is much less predictable. It is likely to be among the first ducks to leave the breeding area in the fall and the first to arrive back in the spring. When the N.C. Wildlife Resources Commission conducted pintail bandings at Lake Mattamuskeet several years ago in November, we received scattered recoveries from several Great Lake states, Ontario, New York and the Chesapeake Bay in subsequent years. One pintail even turned up in western Kentucky. Pintails also may use different routes and stopovers in the fall and spring migrations. At New Jersey's Great Swamp and Pennsylvania's Susquehanna River, for example, pintails are rarely seen in the fall, but may number in the hundreds in the spring.

Waterfowl often move into areas where individuals from widely scattered nesting areas come together to feed on abundant food supplies, refueling for the coming migrations. These "staging" areas may be small and close to the breeding grounds or may be many hundred miles away and serve a large part of a waterfowl population. Nowhere is the latter situation more evident than on the Saint Lawrence River near Quebec City. Almost the entire population of greater snow geese comes together in October and again in April and May during the spring migration to feed on rhizomes in the Cap Tourmente tidal marshes. During this time waterfowl managers have the unique opportunity to take aerial photographs of the white geese and get an accurate count of an entire waterfowl population. In the spring this staging area is particularly important before the geese make the non-stop flight of 1,700 to 2,400 miles to smaller staging areas near the breeding grounds.

Food and weather are more likely to delay or hold up enroute the southward migrations of some species than others. The Vermont black ducks might stay north into January as long as food and open water are available, even if they have to use artificially warmed power plant cooling ponds for roosting and feed on waste grain in agricultural fields. Others of their kind, however, may show up in the Carolinas by Thanksgiving even in a mild autumn. Every fall we always have a portion of our coastal wintering Canada geese arrive by October or November. Research indicates that these birds are most likely to be successful breeders and have the strongest tradition of wintering here. Another segment of the population, mostly non-breeders and unsuccessful breeders, seems to take more time making the trip. In most years 75 percent of the Canada geese eventually counted in our mid-winter period are here by Thanksgiving.

Tundra swans seem to make a dramatic fall arrival in the state. Usually, only a few hundred are present by Thanksgiving, but by the twentieth of December the full complement of 50,000 to 60,000 birds have made the scene.

Some species of waterfowl seem to use staging areas as they enter the state. A large percentage of the Canada goose population



Source: Frank C. Bellrose, Ducks, Geese and Swans of North America (3rd. ed., 1980).

ILLUSTRATED BY JIM BROWN

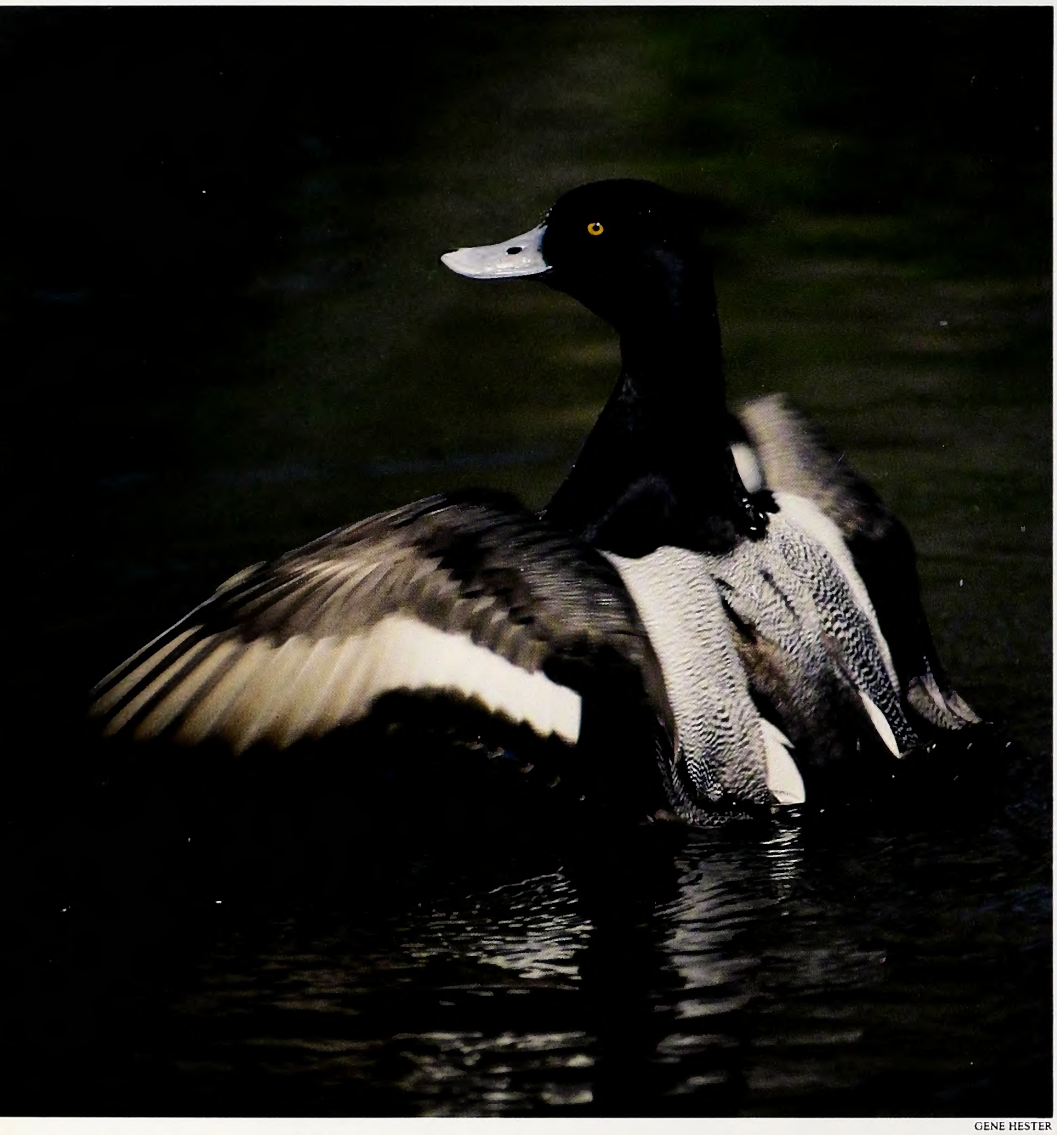
Waterfowl Migration

For years, many of us have thought of the flyways as four giant funnels that collect waterfowl from the northern breeding grounds and deliver them to their more southerly wintering grounds. Only in a general sense is this accurate, however. The Atlantic, Mississippi, Central and Pacific flyways serve largely for administrative and regulatory purposes.

Increasingly sophisticated tracking methods reveal a far more complex, interlinking network of migration corridors that do not always follow the flyway concept. Today, biologists know that the migration corridors of a single species like the pintail, mallard or widgeon may begin in Alaska or at points across Canada and the northern plains states. From these breeding grounds, they stretch south in an incredible network that virtually blankets the continental United States, some extending deep into South America. The illustration shown above reveals some of the major migration corridors used by many species, rather than any single species.

The largest area of prime duck breeding habitat is still concentrated in the prairie pothole country of the upper central plains states and Canada (as shown). Individual species shown in color are placed only in proximity to one of their major breeding areas.

A better understanding of these complex migration patterns will help in long-term efforts to restore waterfowl populations. The key to success lies in ensuring there is adequate prime breeding habitat, as well as sufficient winter resting and feeding grounds where birds receive adequate protection.



GENE HESTER

Most greater scaup *like this drake (above) fly all the way from breeding grounds in northern Alaska across Canada to the Northeast, then swing south down the Atlantic Coast. The pintail (right) and mallard (opposite page) follow far less predictable migration corridors that blanket and crisscross all the traditional flyways. Those that winter in North Carolina arrive here from many directions.*

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first makes its appearance at Lake Mattamuskeet every fall. As the season progresses they tend to disperse to other areas such as Lake Pungo, Currituck Sound, and the Chowan River. This has been most evident in recent years and may be a response to competition for food resources. Swans also seem to show this dispersal. Canvasbacks stage at Mattamuskeet when they first arrive in November. They feed heavily there on abundant wild celery and other aquatic vegetation for several weeks. They then suddenly shift to Pamlico Sound to feed on small brackish water clams, even though the aquatic plants at Mattamuskeet are far from exhausted.

Waterfowl have a tendency to winter in the same areas, although this tendency does not appear to be as intense as breeding area homing, and it sometimes can be affected by climatic and habitat conditions. From the Atlantic Flyway Canada goose neck-collaring project, which was just completed, we found that Canada goose populations, even those in the South, have a strong tradition of wintering in the same regions from year to year. These traditions tend to endure despite mild weather and the development of new food sources in northern states. The early migrants probably play the most important role in maintaining these traditions. This is important to the management of Canada geese because it indicates that if we protect populations from significant harvest until they reach their wintering grounds we can increase these populations by carefully managing them on the wintering grounds. Tundra swan populations wintering in North Carolina also seem to exhibit strong fidelity to their wintering grounds.

Ducks seem to be much more fickle about where they winter. As a waterfowl biologist, I am frequently asked, "Are we going to have any ducks this fall." I can answer this truthfully, "Yes, we will have some ducks this fall!" If I try to get much more specific I'm probably getting out on a limb. Based on annual surveys conducted in major breeding areas we can make some fairly accurate statements about expected fall flights of ducks on a continental and sometimes on a flyway basis. What we can't predict is what states these birds will pass through or winter in. Some of our best waterfowl seasons have occurred in years with relatively low overall waterfowl populations, such as 1989. Of course the opposite is also true. Populations may be well down from the long-term average, but if a significant number of what is left comes to your marsh, you have a great season.

Scaup seem to be somewhat random in where they winter. It seems that in one out of every three or four years, bluebills are found in large numbers all over our coastal sounds and bays, making diving duck hunters extremely

GENE HESTER

happy. In the other years the large flocks may be in New Jersey or off the coast of Florida. In the early eighties, numbers of widgeon, which are the bread and butter ducks for many of our coastal waterfowlers, dropped off sharply in the state. During the same period, large numbers of this species were reported in parts of Tennessee, where thay were previously less common. This may have been a case of the widgeon population changing its winter range temporarily, although we have no proof this actually happened.

Although the inherent mobility of waterfowl is an adaptation that works to their advantage, this very mobility makes waterfowl management a difficult proposition. Wildlife managers working with resident species such as deer or quail sometimes have the luxury of being able to solely manipulate the entire home range of an animal or to set hunting regulations for the entire population. Waterfowl management is a complicated venture that requires cooperation between states, vastly different geographic regions and even nations. Agreement has to be reached between diverse user groups that may live hundreds of miles apart. Members of a deer hunting club might be convinced that they need to reduce their buck harvest if they can see the immediate benefits to their future hunting. But a duck or goose population has to be shared by every jurisdiction in which it occurs, and it's difficult to convince waterfowlers that their conservation efforts will not merely shift harvest to someone else. Biologists were faced with this problem in efforts to help our migrant goose populations.

Actions in one part of waterfowl range can have drastic impacts on populations in another part despite good management programs in the latter. Merely improving wintering habitat here in North Carolina will not in itself benefit the waterfowl resource if waterfowl production is poor because of habitat loss in breeding areas. Neither will increased reproduction maintain itself if degradation of wintering habitats results in the birds going north in poor condition for breeding.

Fortunately, positive changes are coming about in waterfowl management because of the North American Waterfowl Management Plan. The Plan is an effort to bring together state, provincial and federal governments, as well as private organizations with an interest in waterfowl management, into a new spirit of cooperation. The ultimate goal is to improve waterfowl populations through habitat protection and enhancement in all portions of their range. Research to improve our management techniques is also an integral part of the program. Only through a coordinated wholistic approach like this can our migratory waterfowl populations continue to be an important part of our outdoor heritage.

Dennis Luszcz is waterfowl project leader for the N.C. Wildlife Resources Commission.

WATERFOWL ON THE HOME FRONT

In North Carolina, waterfowl restoration is largely a fight to protect and enhance wintering habitat for birds that are born far to our north.

by Tom Monschein

As any waterfowl enthusiast knows, North Carolina has not escaped the effects of the decline of ducks and geese on the North American continent. Though these declines have been evident for some time, they have accelerated during the 1980s, largely as a result of droughts and loss of breeding ground habitat.

The fight to improve waterfowl populations is being fought on several fronts—on the breeding grounds in Canada and the northern territories, and also along migration routes and on wintering grounds. With North Carolina one of these major wintering areas, the N.C. Wildlife Resources Commission is participating in several new cooperative programs designed to protect, develop and enhance wetlands and upland feeding habitat for resident, migrating and wintering waterfowl.

***This pond being** constructed in Hyde County is one of the projects sponsored under the North American Waterfowl Management Plan to provide resting and feeding areas for waterfowl on their wintering grounds in North Carolina. Like prime northern breeding areas, wintering habitat has also diminished in recent decades.*

TOM MONSCHEIN

Canada Goose Field Sanctuary/ Feeding Area Program

Wintering populations of Canada geese in North Carolina have declined from an all-time high of 236,000 birds in 1944 to approximately 20,000 over the past several years. With a wintering population this small, there's no substantial margin of safety to protect the flock from overharvest or catastrophic events. Outbreaks of avian cholera or viral enteritis could potentially decimate the flock beyond recovery.

Changes in farming practices to the north that have enhanced wintering habitat there and overharvest of geese throughout the Atlantic Flyway are partly to blame for the decline. Already, North Carolina and other states in the flyway have reduced hunting mortality on the early migrants, thus allowing flocks that historically winter here to arrive in greater numbers. But restoring our wintering Canada goose flock must also include providing secure loafing, feeding and roosting areas. The development of resting and feeding areas adjacent to concentrations of wintering geese reduces disturbance and breakup of family groups and increases reproductive success by allowing more pairs to reach the breeding grounds in better physical condition. It is hoped that this will result in more young being produced with the instinct to return to historical wintering grounds in North Carolina.

The field sanctuary/feeding area program approved by the Wildlife Commission in November 1987 may help achieve this goal. Through the sale of state waterfowl hunting stamps which became mandatory in 1988, and the sale of waterfowl stamp prints, approximately $75,000 has been earmarked for each of the last three years to finance the sanctuary/feeding program.

At present, seven areas totaling approximately 6,000 acres are being leased from private landowners in key locations adjacent to historical wintering wetland areas. Two areas are located in Hyde County near the Lake Mattamuskeet National Wildlife Refuge and one is situated in Washington County near Pungo National Wildlife Refuge. Other sanctuary/feeding areas are in Currituck, Bertie, Davie and Wilkes counties.

To participate in the program, landowners agree to close all hunting on the leased lands and control vehicular access to prevent disturbing waterfowl. Cooperators are compensated for leaving strips of standing corn unharvested and planting winter wheat between corn strips. Crop stubble is left where wheat is not planted to provide an additional food source. Following the end of the waterfowl hunting season, the corn strips are mowed at timed intervals to provide a high-energy food source during extremely cold periods. All areas are closed to hunting and watched by wildlife enforcement officers.

Over the past two winters, aerial and ground surveys show that areas have received heavy use by Canada geese and other wintering waterfowl. Monitoring begins in mid-October when geese begin to arrive and continues through mid-March when most geese have left to migrate back north. Normally, geese and other waterfowl feed on the wheat more frequently during warmer periods and shift to corn during colder periods.

During the winter of 1988-89, peak use of the areas occurred during the last two weeks of February when a total of 14,531 waterfowl were observed. These included 4,631 Canada geese, 3,800 snow geese and 6,100 tundra swans. In the winter of 1989-90, use peaked in the last two weeks of January with 31,310 waterfowl being observed. This total included 13,935 Canada geese, 5,200 snow geese, 4,000 tundra swans and 7,975 ducks. This represented an increase of 201 percent over the 1988-89 peak, for Canada geese, and an increase of 114 percent during the peak for all waterfowl.

Several more years of observation and study will be necessary to evaluate whether our wintering Canada goose flocks will continue to respond favorably to reduced season lengths, bag limit reductions, and habitat enhancement projects such as the field sanctuary/feeding area program. However, this program will certainly help contribute to our flocks continued well-being, and there is widespread agreement that the program is having a positive effect.

GENE HESTER

***At sunset, a stately** Canada goose, breast feathers glistening with droplets, steps out of the water. North Carolina's efforts to provide geese with improved wintering habitat and sanctuaries show promise in restoring flocks that have traditionally wintered here.*

North American Waterfowl Management Plan

The North American Waterfowl Management Plan (NAWMP), signed in 1986 by both the United States and Canada, brings international teams of federal, provincial, territorial and state agencies and private conservation organizations and individuals together to strive toward a common goal of restoring waterfowl and other migratory bird populations to the levels of the early 1970s by the year 2,000. The NAWMP will provide protection and enhancement of priority wetland habitats from the Gulf of Mexico to the Canadian Arctic, and also restore rare ecosystems, assist farmers with conservation programs and educate citizens about the need to protect wetlands for wildlife and society.

Specific objectives of the NAWMP are to protect 6 million acres of quality waterfowl habitat in Canada and the United States, and to achieve a continental breeding duck population of 62 million birds which will support a fall flight of 100 million ducks. Objectives also include maintaining a continental wintering goose population of 6 million birds, and a continental wintering swan population of 152,000 birds. An estimated $1.6 billion will be needed to reach these goals by the year 2,000.

The NAWMP builds on a history of cooperation between Canada and the United States that is rooted in the Migratory Bird Treaty of 1916. Wetland restoration, management practices and international funding techniques pioneered by Ducks Unlimited in the 1930s are now key elements of the plan.

Seven separate projects—or joint ventures—have been identified. North Carolina falls within the Atlantic Coast Joint Venture which encompasses a 13-state area from Maine to South Carolina. The goals of this joint venture are to protect, enhance and manage approximately 880,000 acres of wetland and upland buffer habitats between now and the year 2,000. In North Carolina, seven key waterfowl focus areas have been identified. North Carolina's goal in the plan is to protect and enhance approximately 84,000 acres within these priority areas.

The Roanoke River Basin is one of the richest ecological systems found in North Carolina, and has been identified as the state's top-priority focus area. Original goals for this

GUY C. FONTAINE

***In recent years,** more tundra swans have wintered in North Carolina, and can now be hunted under a special permit. These magnificent birds have not experienced the sharp declines that have plagued some other waterfowl species.*

area identified 33,000 acres for protection and 9,100 acres for enhancement, but these goals have already been exceeded with approximately 49,000 acres planned for protection by the U.S. Fish and Wildlife Service, The N.C. Nature Conservancy and the N.C. Wildlife Resources Commission.

A joint venture project plan for the Roanoke River Basin was completed in June 1990 to protect critical waterfowl habitat. Habitat enhancement and management will increase resident wood duck production and provide better migrating and wintering habitat for black ducks, mallards and other waterfowl. Opportunities also exist to improve upland habitat for wild turkey, small game, white-tailed deer and nongame wildlife.

Recently, a joint venture proposal was submitted to the North American Wetlands Conservation Council requesting assistance with the purchase of three tracts totaling 1,226 wetland acres situated along the Roanoke River in Martin County. If approved, the Council will provide $353,500 toward this important wetland acquisition. The Council was formed under the North American Wetlands Conservation Act signed by President George Bush on December 13, 1989. The ceremony culminated months of work by North American Plan partners who lobbied for the passage of the act and organized field visits to wetlands and many briefings for House and Senate staffers.

The act gives congressional recognition to the NAWMP as a framework for maintaining and restoring an adequate base of habitat to ensure perpetuation of populations of waterfowl and other migratory bird species. It also provides a funding source and a mechanism for reviewing and approving wetland protection, restoration and enhancement projects in the United States, Canada and Mexico.

The act provides a permanent appropriation of approximately $15 million, and authorization for Congress to appropriate another $15 million. The first $15 million is guaranteed every year without further action by Congress. These funds come from unspent interest in the Wildlife Restoration Fund set up under the Pittman-Robertson Act (Federal excise tax on sporting equipment), and from various unallocated fines related to the violation of migratory bird laws. In the past these funds have gone directly into the Federal Treasury. The second $15 million will require annual appropriation by Congress and is not nearly as certain.

Some 50 to 70 percent of the projects to be funded by these dollars will be in Canada and Mexico, and 30 to 50 percent in the United States Projects will be reviewed and prioritized by the nine-member North American Wetlands Conservation Council and approved by the Migratory Bird Commission. All of the funds authorized and/or appropriated by this act will require a non-federal match. Other "partners" in the proposed Roanoke River land purchase include the N.C. Recreation and Natural Heritage Trust Fund, the Easton, Maryland, Waterfowl Festival Council and the N.C. Wildlife Resources Commission.

Additional joint ventures focus areas in North Carolina include the Pamlico-Albemarle Peninsula, Pamlico Sound Marshes and Impoundments, Currituck Sound and North River Marshes, Currituck Outer Banks, the Pee Dee River Basin and Croatan National Forest Wetlands. In the future specific project will be identified and undertaken within these focus areas.

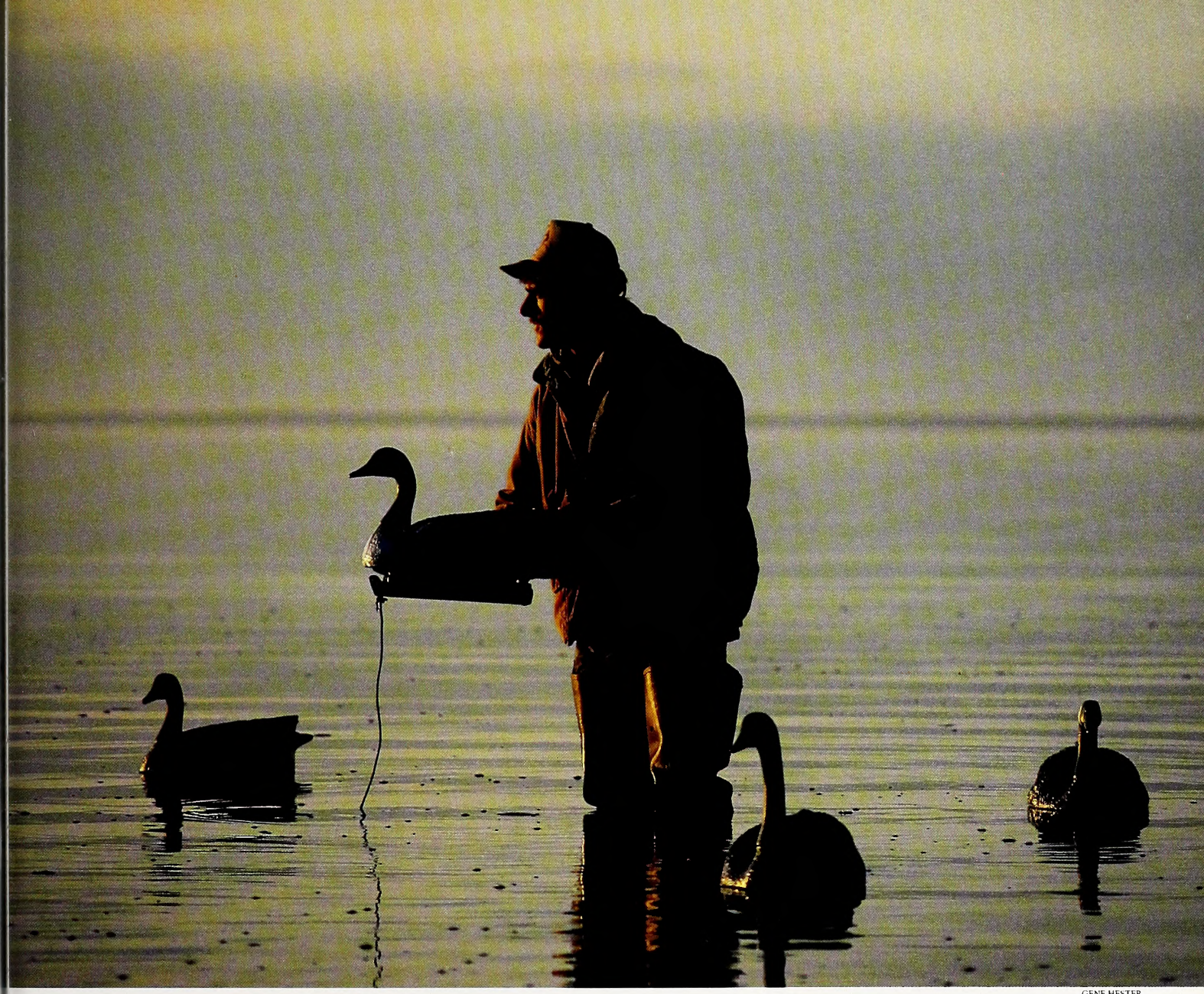
The M.A.R.S.H. Program

Begun in 1985 by Ducks Unlimited, MARSH (Matching Aid to Restore States Habitat) is a reimbursement program that provides matching funds for wetland acquisition and/or enhancement in each state based on DU's income within that state.

North Carolina's first MARSH project took place on the Mackay Island National Wildlife Refuge located in Currituck County. The project involved the installation of two large water-control structures to enhance an 800-acre impoundment for local wood duck and black duck production and for improving wintering waterfowl habitat. The Mackay Island project was dedicated on August 15, 1987 in memory of the founder of DU, Joseph P. Knapp, who formerly lived on the refuge property. The dedication occurred on DU's 50th anniversary.

The second project involved the purchase in 1989 of a beaver pond and upland buffer area totaling 135 acres located in Davie County on Hunting Creek. The Southern Piedmont Waterfowlers Club was instrumental in helping DU and the Wildlife Commission acquire this important wetland. Club members also assisted with the erection of wood duck nesting boxes on the area.

The third MARSH project involved the purchase in 1989 of the 3,750-acre Conine Island located along the Roanoke River in



GENE HESTER

***A goose hunter** with his decoys enjoys a moment that will surely linger in memory. Through state and federal regulatory agencies, and such groups as Ducks Unlimited, hunters have traditionally provided the most significant support for efforts to restore waterfowl populations. That is certainly understandable since they have so much to lose if restoration fails.*

Bertie County. This project protected valuable wetland habitat for local wood duck production and wintering habitat for black ducks, mallards and other waterfowl.

Other Wildlife Commission projects that DU has committed funding toward involve the purchase of 245 acres of wetlands along Sweetwater Creek in Martin County, the enhancement of 200 acres on Loop Road Waterfowl Impoundment in Hyde County on Gull Rock Game Land, the enhancement of 820 acres on Catfish Lake Waterfowl Impoundment in Jones County in Croatan National Forest, and the purchase of 42 acres of important wetlands in Robeson County.

Since the MARSH program began in 1985, DU has committed a total of approximately $500,000 to Wildlife Commission projects. Additionally, other projects involving the U.S. Fish and Wildlife Service have been funded on the Alligator River National Refuge in Dare County, the Pungo National Wildlife Refuge in Hyde and Washington counties and the Pee Dee National Wildlife Refuge in Anson and Richmond counties. The Wildlife Commission and DU are presently working on other MARSH project proposals located in Burke, Cabarrus, Lenoir and Wake counties.

The Past, Present and Future

Over half the wetlands that were present in North America just 200 years ago have disappeared, and approximately 500,000 acres continue to be lost annually. The quality of the wetlands that remain is often severely degraded by pollution, sedimentation, agricultural runoff, invasion of pest weeds, toxic chemicals and other factors. Under increasing human encroachment there are quite simply fewer and lower quality areas for waterfowl and other wetland wildlife to live.

The N.C. Wildlife Resources Commission has established ambitious goals and specific objectives to secure the future of waterfowl through joint commitments with federal and state natural resource agencies, conservation groups and others. Key wetlands and upper buffer areas are in need of immediate attention. Meeting this challenge will create a future where plentiful migrations of ducks, geese, swans and all other migratory species dependent upon wetlands may once again fill the skies. ⊠

Tom Monschein is waterfowl habitat specialist for the N.C. Wildlife Resources Commission.

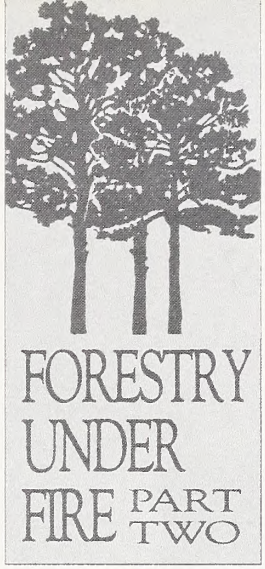
Wildlife IN WINTER

photographed by William S. Lea

Most wildlife species do not hibernate through the season of Boreas. Instead, life is a daily fight for survival in snow or shine—winter's elements a pitiless and unforgiving enemy.

The days grow shorter, the nights darker, the winds colder. Food and shelter are the only currency taken in return for life. Birds such as the pileated woodpecker must eat more to stave off winter's bitter grip. The raccoon, bundled in a blanket of fat and thick fur, seeks a den in a hollow tree.

The coyote will live another day, but then it's back to the hunting grounds, or it too will feel Nature's bite. The hungry white-tailed deer has taken its chance—out to a field to browse. Will a predator—man or otherwise—find it?



Can Wetland Forestry Survive?

An environmental donnybrook is brewing in the east as forest practices in wetlands are being scrutinized as never before.

by Lawrence S. Earley

Not too many springs ago you could stand on a logging road in East Dismal Swamp in Washington County and whistle up a nesting black-throated green warbler, a rare bird in eastern North Carolina. You might also have heard the songs of an incredible concentration of other birds, including a lot of neotropical birds — prothonotary warblers, prairie warblers, great-crested flycatchers, redstarts, hooded warblers.

But in the future, it's not likely that you'll be able to find too many of these songbirds in the East Dismal Swamp. Over the years, much of the wetland forest has gone into soybeans and other row crops and the forest remnant, owned by Weyerhaeuser Corporation, is being converted to pine plantations, a poorer habitat for warblers and many other wildlife species besides. Once stretching over nearly 100,000 acres in Washington and Beaufort counties, the East Dismal Swamp forest today totals fewer than 2,000 acres and is in danger of disappearing.

The fate of the East Dismal Swamp illustrates another one of those environmental dilemmas that continually puzzle and confound us. Natural wetlands perform a host of valuable services: absorbing excess rainwaters and releasing them slowly; filtering impurities from water; providing habitat for fish and wildlife, and nurseries for commercial fish and shellfish; and offering recreation to man. For these reasons, society has sought to stem wetland losses that amounted to as much as 500,000 acres per year for decades.

But forested wetlands are valuable in other ways. Clearcut and intensively managed in pine plantations, for example, they grow more wood than any type of timber land in the South. Foresters say that they can preserve the important functions that wetlands perform even while producing high volumes of sawtimber and pulpwood.

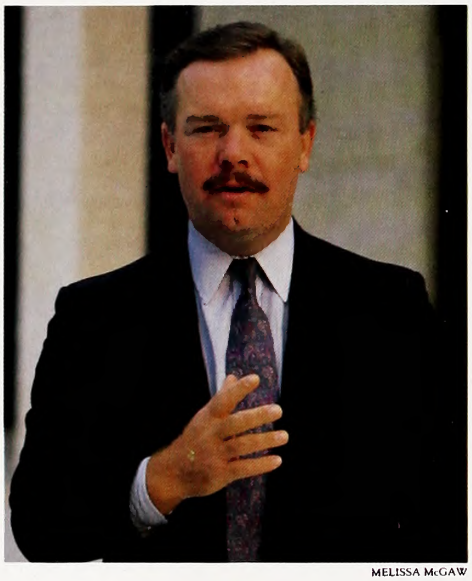
Up to now, society has gone along with this promise, exempting forestry from some of its most restrictive laws protecting wetlands. But across the eastern part of the state today, forestry practices in wetlands are being scrutinized as never before, not only by litigation-minded environmentalists but by regulatory agencies.

Environmentalists say they want balance. "Of all the major activities having an impact on wetlands, forestry is the only one that is still unregulated," says Derb Carter, an attorney with the Southern Environmental

***Nature Conservancy** biologist Merrill Lynch counts tree rings at a large clearcut in the East Dismal Swamp. Lynch and another biologist once located 52 species of breeding birds in the pocosin forest in one hour, an unusually high diversity that rivals bird diversity in mountain forests. Three environmental groups have threatened a law suit to halt the conversion of the East Dismal Swamp to pine plantations.*

FORESTRY UNDER FIRE PART TWO

Can Wetland Forestry Survive?



MELISSA McGAW

"So far there are no formally established programs by which the public interests in wetland forestry can be expressed."

Derb Carter

Law Center of Chapel Hill. Some in the timber industry perceive a different aim: what these environmentalists really want, they say, is to lock out private enterprise from the Coastal Plain.

Not surprisingly, then, the issue of forestry in wetlands has ignited one of the most rancorous environmental battles in years, a battle that's being fought on several fronts — regulatory, silvicultural and emotional.

To understand the regulatory battles, you have to back up a little and consider just how flawed wetlands-protection programs have been. "The major problem with the current wetland protection effort is that no integrated program exists whose explicit goal is to save wetlands," wrote the N.C. Environmental Defense Fund in its 1989 report, *Carolina Wetlands: Our Vanishing Resource.* Indeed, the law that has afforded the best protection for wetlands, Section 404 of the federal Clean Water Act (1977), is not even explicitly aimed at wetlands. It regulates the discharge of dredge and fill material into the waters of the United States. Moreover, this law has been riddled with loopholes and is limited in scope. Coastal wetlands such as salt marshes receive good protection, but freshwater wetlands get far less attention (see "Wetlands and the Limits of Law," *Wildlife in North Carolina*, August 1987). Most scandalously, however, federal agencies involved in wetland protection didn't share a consistent definition of "wetland" until 1989, leaving regulators often as confused as the regulated.

Wetlands protection received a boost in 1985 with the "Swampbuster" provision of the 1985 Farm Bill which denied crop supports to a farmer who converted a wetland to cropland. But it wasn't until 1988, with the publication of a report by the National Wetlands Policy Forum, that wetlands protection became a truly national goal. At the request of U.S. Environmental Protection Agency administrator Lee M. Thomas, representatives from environmental organizations, regulatory agencies and a variety of industries sat down together and recommended new policies to protect and manage wetlands. Among these recommendations was a clearly stated goal: "to achieve no overall net loss of the nation's remaining wetlands base."

President George Bush adopted this as a campaign pledge, and it has since become a controversial national goal with effects that have been far-reaching. Federal regulatory muscles were gradually firmed up and long-standing defects in wetland protection were addressed. In 1989, for example, EPA, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers and the Soil Conservation Service finally adopted a single definition of wetlands.

It didn't take long for this tougher stance on wetlands to be felt by the timber industry, and predictably there were howls of outrage. The newly adopted definition of wetlands is so liberal, foresters say, that it includes massive amounts of private land in the Coastal Plain. Robert Slocum, executive vice-president of the N.C. Forestry Association, estimates that 70 percent of the Coastal Plain might be considered as wetlands according to the criteria set forth in the new *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (1989). Much of the 9 million acres of forest land in the East might be barred from forestry or any other development. "If you eliminate forestry on those lands or restrict the ability of private landowners to grow and manage a crop or a product, you better believe it'll affect the forest industry," says Slocum. "Will mills be able to find enough wood to operate?"

Forestry also began to feel the pinch from newly aggressive regulatory agencies. In 1989, EPA assumed responsibility for administering the forestry exemption to Section 404 from the Corps of Engineers, which administers Section 404. The move reflected EPA's belief that exemptions had been granted too easily in the past. Since then there have been several actions in North Carolina that show the agency's get-tough spirit. In one, EPA denied Georgia-Pacific Corporation a permit to establish a pine plantation in a pocosin wetland. In another, it found a Georgia-Pacific ditch in a Green Swamp wetland savanna to be in violation of Section 404 codes and ordered it to be plugged up. Late last summer, the Corps of Engineers came through with its own protective edict, announcing that it would be more stringent about permitting earth-moving activities in wetlands. (In late September, however, the agency said it would no longer protect wetlands converted to cropland before the 1985 "Swampbuster" provision, a move conservationists said would

weaken the "no-net-loss" policy.)

It was this new federal aggressiveness that emboldened environmentalists to test one of forestry's most prized possessions — its exemption from Section 404. Last January three organizations, the N.C. Environmental Defense Fund, the Southern Environmental Law Center and the N.C. Coastal Federation, threatened to bring suit against Weyerhaeuser and EPA to halt the conversion of wetlands to pine plantations in East Dismal Swamp. The groups contend that the activities associated with the establishment of Weyerhaeuser's pine plantations are not exempt from Section 404 and that a permit is required. They argue that forestry ought to be subject to the same environmental-review process now required for so many other activities that affect wetlands. "So far there are no formally established programs by which the public interests in (wetland forestry) can be expressed," says Derb Carter, a lead lawyer in the action.

The heart of the legal action against Weyerhaeuser and EPA is that ditching and site preparation in the East Dismal Swamp have resulted in an illegal conversion of the pocosin wetland to a nonwetland. "The whole intent of intensively managing these plantations is to make them drier — whether it's digging ditches, or putting beds up so that the pine seedlings' roots don't get wet," says Carter. Weyerhaeuser argues that its pine plantations in East Dismal Swamp are still legal wetlands according to the new *Federal Manual*. Thus, their activities have not resulted in an illegal conversion.

Because EPA agrees with Weyerhaeuser, it is a party to this suit. "There's no doubt that (Weyerhaeuser's) operations have changed the ecosystem," says Tom Welborn of EPA, "but the problem in dealing with the regulations is that even if the site changes ecologically, it can still meet the criteria for a wetland."

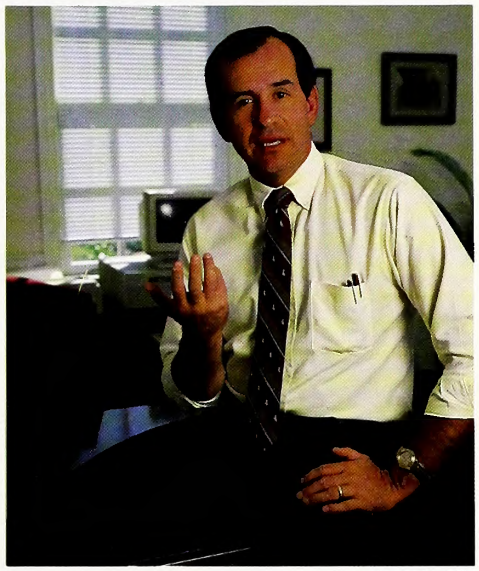
If the suit ever goes to court, it will be the first legal challenge in North Carolina to the forestry exemption and one of the first nationwide. The stakes are enormous. According to one view, a Weyerhaeuser loss would encourage similar suits against other companies. Worse, perhaps, wetland pine plantations established after 1977, the year Section 404 regulations went into effect, might potentially be illegal and be subject to restoration. Says Bob Slocum, "Putting timber operations under public review would provide a ready-made formula whereby groups such as those that have filed this suit could virtually shut down forestry."

Not surprisingly, the timber industry has mounted one of the most intense legal and public-relations defense efforts seen in these parts. "Every timber company in the United States is jumping on the bandwagon to help Weyerhaeuser," says James Woodman, director of the Atmospheric Impacts Research Program at North Carolina State University and former director of forestry research at Champion International. "And the reasons are clear. This suit targets the white knight of all the timber industries. Weyerhaeuser probably has the cleanest skirts of any timber company in the United States in terms of being environmentally sensitive and scientifically correct. If Weyerhaeuser loses, the rest of the timber companies are in big trouble."

The timber industry took another public-relations blow last spring when a study by Duke University graduate student Gordon Cashin blamed forestry for most of the wetland losses in the Coastal Plain of North Carolina. Agriculture has generally been the villain in nationwide destruction of wetlands, but because timber companies own so much of the forested land in the Coastal Plain, Cashin wrote that he was "not surprised" that it was responsible for 52.8 percent of the wetland losses. To compile these statistics, he assumed that a pine plantation in a wetland site meant that the previous wetland was "lost" or destroyed.

The report was immediately controversial. To some environmentalists, it proved that an even-handed wetlands-protection program would have to include forestry. "You can't have a program if you're exempting the leading cause of your loss," said Derb Carter.

But the timber industry savaged Cashin's report. Last summer, at a committee meeting of the Albemarle-Pamlico Estuarine Study weighing the effects of forestry on wetlands, one forestry supporter declared that putting a pine plantation in a wetland might change the wetland's functions, but did not necessarily destroy them. "Some wetland functions even improve with clear-cutting," said Russ Lea, director of the Hardwood Research Cooperative at N.C. State University. "I would say that certainly there's a functional alteration when foresters intensively manage



MELISSA McGAW

"Putting timber operations under public review would provide a ready-made formula whereby groups such as those that have filed this suit could virtually shut down forestry."

Robert Slocum

FORESTRY UNDER FIRE PART TWO

Can Wetland Forestry Survive?

DEBORAH CONGER

***Although conservationists** worry about reflexive clearcutting in wetlands like this bottomland hardwood forest, some forestry practices are changing in wetlands. At Union Camp's operations along the Roanoke River, foresters are encouraged by the productivity of wetland sites regenerating naturally. The plantation approach in bottomlands has been halted.*

wetlands for pine plantations. So I take issue with the word 'loss.'"

But at the same meeting, University of North Carolina at Wilmington biology professor Courtney Hackney saw a difference between establishing pine plantations on an upland site and altering a wetland site for the same purpose. "There are situations where pine forests are being managed for more pine forests and drainage is simply a way of helping with harvesting," he said. "But if you take a very wet situation, a pocosin, for example, and make it drier not to grow more pocosin but to grow pines, that's very different."

Indeed, what happens to the ecosystem after a pine plantation is put in is an issue that's been obscured by all the legal wrangling, according to Curtis Richardson, Cashin's adviser and the director of the Duke (University) Wetland Center. "Is it a pocosin? Of course it's not," he says. "The legal ramifications are important, but the more important issue is the ecological issue: the wetland is not what it once was."

But the chasm that separates foresters and environmentalists over wetlands forestry is not just over legal definitions. What's clear is that both interests differ fundamentally over what makes good forestry.

The timber industry supports an intensive silviculture as represented by the pine plantation, where high volumes of mostly pulpwood are produced as rapidly as possible. In their public presentations, some industrial foresters often juxtapose two different slides: one that shows a natural pocosin, with a nondescript-looking stand of pond pines, against another showing a dense wall of 30-year-old plantation-grown loblolly pines. If you want to produce a lot of wood, the implication is clear, the managed plantation is superior to the natural stand.

Additionally, say foresters, many timber operations, though they are exempt from Section 404 permit requirements, follow tough, voluntary "best management practices" that ensure the functioning of wetlands. These BMPs guide all timber-producing activities — road building, stream crossing, timber harvesting and regeneration.

Environmentalists favor what some might call a "kinder, gentler" forestry, an alternative forestry that works with the ecosystem rather than against it. "If you're going to practice forestry in those areas, then clearly the preferred approach is to retain the wetland system by managing it as the natural ecosystem it is," says Carter. He adds that such a forestry would protect the functioning of the wetland while providing for timber and wildlife.

The ecosystem approach to silviculture has been around for a while, but in the wake of the spotted owl controversy in the Pacific Northwest it has been dusted off and given a new look. The basic premise of this approach is that forests can be managed to sustain the entire ecosystem rather than be converted into single-species tree factories. Indeed, the U.S. Forest Service this year included the approach in a research program called "New Perspectives for Managing the National Forest System." The program calls for new technologies and concepts to be developed to "retain much of the forests' ecological structure and minimize forest fragmentation." At the same time these forests would provide for a harvest of natural resources, including timber.

Although the multiple-use goals of national forests are quite different from those of industrial forests, some believe that the same social pressures forcing changes in silviculture on public lands will soon affect industrial practices. "In 20 years we'll be practicing forestry from a different perspective," predicts James

Woodman. As an industrial forester in Washington, Oregon and California, Woodman watched as forestry practices evolved under the goad of public discontent. California in particular passed very stringent forest-protection laws that governed private lands. The size of clearcuts were so limited that they became almost uneconomical. He believes the same social pressures may eventually create a "new forestry" in the Southeast. "The new philosophy may very well be to promote maximum forest cover to protect the earth against the effect of global climate change. Clearcutting may be banned. We'll be concerned about water quantity, water quality, biological diversity and a lot of other things that have not generally been valued, especially by the private landowner."

In the meantime, conservationists suggest that the forest industry could accommodate concerns about wetlands in two ways:

- Practice a less intensive forestry in wetland areas. Don't bed; let the areas naturally regenerate. Practice partial cuttings or selective harvesting rather than clearcuts.
- Practice intensive forestry in upland areas. Many private landowners do not regenerate their lands after harvesting their timber. By aggressively pursuing these landowners, as well as abandoned farmland, the industry might expand its timber base and make up for reduced harvests in wetlands.

Skeptical industry officials point out that the growth rates of pines in intensively managed wetland plantations are two to three times that of natural or unmanaged forests. Weyerhaeuser forester Charlie Williams says that an acre of intensively managed loblolly pine can produce as much wood as 3.82 acres of naturally grown pond pine. "If we lose bedding, which is essential for loblolly pine," he says, "it drives us to a point where forestry is no longer a reasonable investment. The thing that frustrates me about the environmental community is that there's no appreciation for the business that we're in and the thin margins we operate on."

"How much is enough?" asks Carter in return. "How much more wetlands are we going to dedicate to maximum timber production at this environmental cost?" Adds N.C. Wildlife Resources Commission biologist Dennis Stewart: "To get responsible ecological forestry, corporate economics will have to be tempered by a better understanding of the affected ecosystem."

Such statements may make conservationists seem economically naive. On the other hand, conservationists can't help hearing in foresters' complaints the familiar sound of threatened self-interest uttered by every industry that has come under regulation. Fine and dandy, says Weyerhaeuser's Williams. "But if society values this pocosin more as a natural wetland than as pine plantation, then society should pay private enterprise which has made these long-term investments."

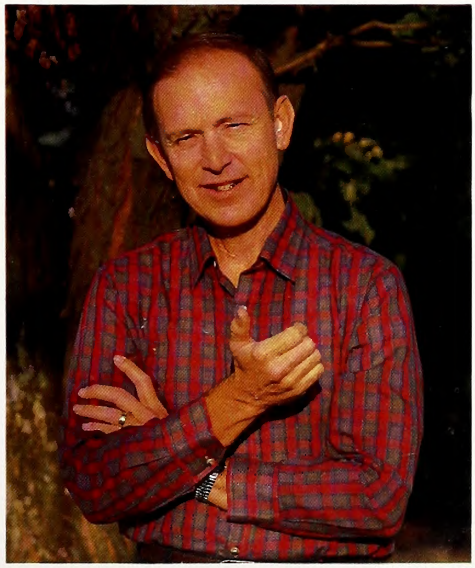
The conflict between the forest industry and environmentalists over forestry practices in wetlands is not a morality tale starring "guilty producers and innocent consumers," as writer Wendell Berry has put it. It represents a dilemma increasingly faced by policymakers in the South as they try to resolve competing claims on both private and public lands. And it involves choices that all of us may have to make. "Do they know what they're giving up?" asks Weyerhaeuser forester Bob Hollatschek of a society that seems to favor restrictions on wetland forestry. "Are they going to be willing to pay more for lumber and paper products?" That's one choice. Will we also be willing to place more wetlands under public ownership in order to protect their life-giving functions?

Another choice open to us is the high road of ecological living. The forest industry's expansion into wetlands is fueled not only by its own desire to make money, but by Americans' wasteful habits: we probably throw away more paper annually than is produced in all the country's paper mills. Conservation and recycling offer little-considered ways to take the pressure off our vanishing wetlands, but will we make the effort?

Yet it's in the realm of public policy that the final resolution of this conflict will be achieved, although the exact shape of that agreement is hazy at this point. One factor will be the political commitment to the President's goal of wetland protection. If that is maintained in the face of stern opposition — and in the shifting winds of politics today, one can't be certain about that — then the burden of proof will continue to rest on the timber industry to show that its methods are compatible with the ecological functioning of wetlands — to prove, that is, that we can *have* our cake and *eat* it too. ⊠

"In 20 years we'll be practicing forestry from a different perspective. The new philosophy may very well be to promote maximum forest cover to protect the earth against the effect of global climate change. Clearcutting may be banned."

James Woodman



MELISSA McGAW

J.P. MORGAN'S BIRDS

Every winter
for nearly 40 years,
one of the world's
richest men would sneak
out of New York City
to hunt bobwhites
at his secret hideout
in Guilford County.

by Vic Venters

PHOTOGRAPHS COURTESY OF RALPH DONNELL

It's not hard to wax sentimental about old-time Southern quail shooting. Across the region, bird-hunting prospects grow ever dimmer as coveys shrink and then disappear from favored hunting grounds. The golden age, it seems, has long been committed to the main text of history; modern agriculture and development are writing mostly epitaphs today for Mr. Bob's followers.

Ralph Donnell knew the better days, perhaps as well as any man living. He was born in 1910, son of William Donnell. In the 1890s, William had been a professional quail hunter whose reputation had helped him become manager at Climax Lodge, the Guilford County quail-hunting hideaway for banking tycoon J.P. "Jack" Morgan Jr. and several of his wealthy business colleagues. The Donnells managed the lodge from its beginnings at the turn of the century to Jack Morgan's last hunt in 1943.

Ralph is the last living person associated with the lodge, and in his possession are a collection of rare photos and logbooks that recorded the hunting activities at Climax Lodge. Most important, perhaps, Ralph has his memories, which he graciously shared with *Wildlife in North Carolina.*

The lodge at Climax was originally founded in 1899 by General John Gill and James Swan Frick, two Baltimore millionaires. In 1904, Gill sold his interest in the lodge and a new club membership was formed between Frick and two of Jack Morgan's business partners, Charles Steele and Robert Bacon. Jack Morgan — soon to inherit his father's helm at the gargantuan J.P. Morgan & Co. banking and securities firm — joined in 1905.

The Donnell family lived on the grounds in a nine-room house paid for by the wealthy club members. For 44 years, William Donnell's job was to make sure the big men stayed happy during their stay in Dixie, and he spent the rest of each year training dogs, maintaining the lodge and leasing the land from local farmers. As William grew older, Ralph succeeded him, in function, if not in title. "I started off in 1927 driving the men around in cars," Ralph said, "and as Dad grew older I did more and more."

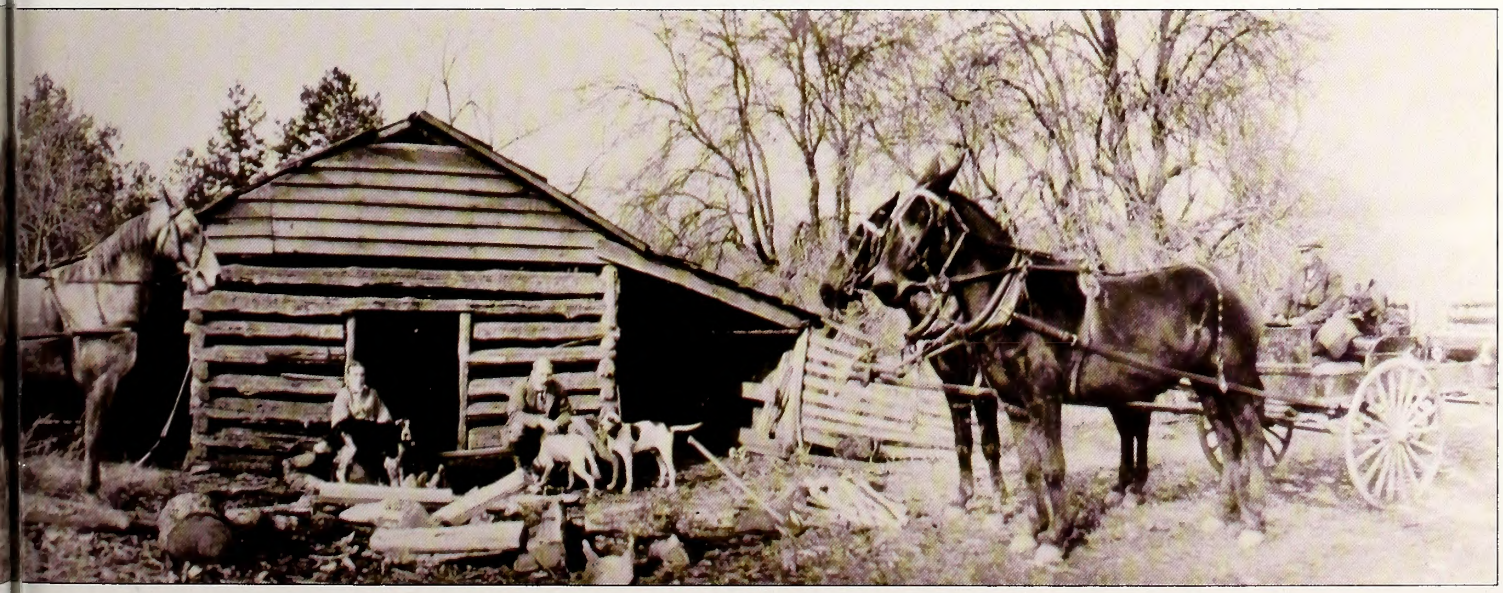
It's hard to imagine now, but today's bustling Triad region was then, at the turn of the century, the quail-hunting capital of the world, at least measured by the number of giant hunting lodges in the area. This was the Gilded Age, both for quail and capitalism. The Yankees had the bucks, the South had the birds. J.P. Morgan & Co.'s reorganization of the Southern Railway in the 1890s put Piedmont North Carolina within easy reach of big northern cities. Scores of industrialists, bankers and railroad tycoons rode private rail cars south to Randolph, Davidson and Guilford counties to sample a shooting life that few, if any, native Southerners could then afford.

They built grand lodges, leasing vast hunks

MELISSA McGAW

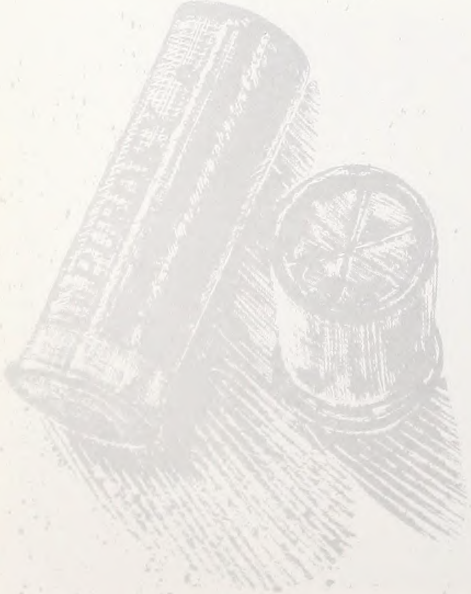
***Ralph Donnell** and his wife, Julia.*

***Near the little town** of Climax, rich and powerful Northerners like J.P. Morgan gathered each winter from 1899 to 1943 to hunt bobwhite quail. Morgan and his fellow hunters leased 20,000 acres and built a hideaway lodge. Morgan was an intensely private man and this is the only known photo (below) of him at Climax. He is seated with the dogs at center right. One carriage carted the hunters, the other hauled the dogs.*



A covey scatters *as a hunter takes aim. It wasn't unusual for the shooting parties at Climax to find 20 or more coveys per day—all wild birds. Note the birds flushing in open terrain. Bobwhite quail have abandoned such habits today.*

Although Morgan *was fabulously wealthy, his retreat at Climax was comparatively modest. A target of death threats and assassination attempts in New York, Morgan and other members kept the existence of the lodge secret, preferring solitude and relaxation when at Climax.*



of land from impoverished yeoman farmers. In days of pre-mechanized agriculture, quail flourished on the small farms that dotted the rolling Piedmont landscape. A few of these lodges were ostentatious affairs, boasting cavernous dining halls, billiard rooms, gymnasiums, squash courts, Turkish baths, shooting rooms, swimming pools, bowling alleys and driven hunts for imported pheasant. On some, there might be an English gamekeeper, and probably a kennel of 100 or more dogs.

Land leases might reach as high as 35,000 acres. Lavish shooting parties were common.

Although Morgan was, as one biographer noted, "without question the most important figure in world financial history of the first third of the twentieth century," Climax Lodge was a more modest retreat. "It wasn't anything like some of those other places," Ralph explained, shaking his head and pointing to the old picture of the lodge in the photo album. The lodge itself was an unprepossessing two-story white frame building, elegant and comfortable, but hardly a mansion of Biltmorian proportions. "These were private men, they didn't have any need to show off. If they brought down guests, it was only one or two."

Perhaps Morgan's background had something to do with lack of flashy spending. Unlike many of his nouveau riche contemporaries, Morgan came from old-line Yankee stock; his ancestors had arrived in Massachusetts in 1636. The existence of the lodge and its members was always kept quiet as well. Morgan, with his massive financial power, was the target of numerous death threats and attempted assassinations. In New York, he usually traveled with bodyguards or heavy police escort. He never needed this at Climax, and the retreat provided a welcome respite from the rigors of his business life.

Morgan's and Steele's real reason for coming, of course, was for bobwhites. "They didn't come down to do business," Ralph smiled. "Mr. Morgan and Mr. Steele loved to hunt quail. When they first started coming down, they'd stay all winter practically." The men would arrive by private railcar. Both Steele and Bacon had their own cars; Morgan usually rode down in Steele's car, named *The Erie*. After Steele became too old to hunt, Morgan came south in a chauffeur-driven car.

When the lodge first opened, the owners leased 13,000 acres of surrounding land, purchasing only six acres for lodge grounds. When Morgan joined, an additional 7,000 acres were leased. Farmers were paid 15 cents per acre per year. "That didn't sound like much, but it was enough for them to pay the taxes on their land in the Depression," Ralph said. "Otherwise a lot of people would have lost their land."

The farmers continued to till their land, and could even hunt — for anything but quail, that is. The land produced a bumper crop of birds, despite the fact that there was little active quail management. "The lands we leased were just working farms," Ralph explained. "All we did was give them money for the privilege of shooting quail."

Most farms consisted of small plots of wheat and corn, ideal habitat for bobwhites. Occasionally, Ralph or his father would give some grain to farmers to plant food strips alongside the woods, or to scatter for the birds when the weather became very cold.

Morgan and his companions all shot with English doubles, all 12 gauges. Personal valets — also English — accompanied each man into the field, carrying the guns until the dogs pointed. Morgan used a pair of matched doubles crafted by Henry Atkin, a London custom gunmaker once employed by the famous Purdey gun shop. Ralph and his father both shot 20 gauges — L.C. Smith's. "The men didn't like for anyone to use automatics. Only doubles were allowed." Until the late 1920s, the men hunted from horse-drawn wagons. After that, Buicks — often with Ralph at the wheel — supplanted the wagons. In the early days, the limit was 40 quail per day, a bag well within reach of the hunting parties.

Unlike some of the other lodges in the area which maintained kennels of 100 or more dogs, Climax never kept more than 18 setters or pointers. Because the hunting parties were small, each would take four dogs, two for the morning, two for the afternoon. "We never did believe in keeping a whole slew of dogs," Ralph said. "Back then, you could get trained dogs, good ones, for $25. Those dogs could do everything but talk."

After each day, the results of the hunt, the weather conditions and the names and numbers of hunters would be recorded in the lodge's gamebooks. In the first twelve years of operation, the logs show hunters shot 12,718 head of game, mostly quail but also a few rabbits and woodcock. During the next 12 years, ending in 1924, the hunters bagged a total of 9,910 quail. From 1924 to 1936 the bag dropped to a total of 4,361. From 1936 to 1943, its last year, they killed 1,071. "We had so many quail to eat back then, that I don't even like a quail today," Ralph said. "Shoot, I'd rather have a piece of chicken any day."

"Near the end, you didn't have anyone who could walk much," Ralph continued. "I'd drive Mr. Morgan around in those old Buicks — they were all Morgan green — and if the dogs found some quail out in a field, and it wasn't too far from the car, he'd get out and shoot. Otherwise, you carried his gun and he'd motion for you to shoot. They always wanted some quail to carry back to New York."

Throughout his life, Morgan remained an intensely private man, so elusive that a frustrated biographer wrote, "It has proved virtually impossible to bring him to life on the printed page."

Perhaps he should have talked to Ralph. "When you shook hands with Mr. Morgan," said Ralph, "you *knew* you shook hands with a man. It would be like meeting, not the president, but the King of England." Even today, 47 years after his death, J.P. Morgan Jr. is still *Mister* Morgan to Ralph Donnell.

"If Mr. Morgan ever said something that he thought later that he shouldn't have, he'd come back and beg your pardon," he continued. "He was just that kind of man, and a lot of people in that position would never have done that."

Although the tycoons never mingled much with the local populace outside of the Donnells and the other lodge staff, Morgan could be generous to the needy. "One time this black community was trying to build a church and they didn't have any money," Ralph added. "Mr Morgan asked my father to find out how much it would cost to complete it. My father said it would cost $750, which was a gang of money in those days. Mr. Morgan said 'I'll give you a check for it.'"

Frick died in 1927, and by the mid-1930s Steele was too old to hunt. Morgan's hunts continued, although the Depression, increased taxes and anti-monopoly laws whittled away at his empire. His trips became less frequent, although he still found time to spend a week or two in Climax every winter. The drop in numbers of quail killed was likely because there were fewer hunters to shoot them, but also because of the woes that increasingly mechanized agricultural practices were placing on bobwhite habitat.

January 21, 1943 found Morgan at Climax. After six days of hunting, a heavy front rolled in. On January 28, he recorded this last terse entry: *Awoke to find no electricity, trees ice covered, temperature 33. Roads ice free. Tree down across road near Greensboro cleared away by noon.*

Less than one month later, Jack Morgan was dead, victim of a stroke suffered in Florida.

Morgan's son, Junius, declined to continue the lodge. Ralph was married, in the army, and soon to head overseas for the war. The lodge building met an ignominious end — it was torn down and sold for building supplies, a commodity then in short supply.

The glitter was gone. ⊠

Squealers Hard To Count

Regional Wood Duck Monitoring Begins in Southeast

Written and Edited by Vic Venters

With popular prairie ducks like pintails and mallards in trouble, wood ducks are becoming an increasingly important species to Atlantic Flyway hunters in the South. In recent years wood ducks have been the most numerous, or second most numerous, duck bagged in the Atlantic Flyway.

Since the closure of market hunting in 1918, wood ducks have bounced back from near extinction to become one of wildlife management's biggest success stories. However, because of their nesting habits — in swamps or small ponds — wood ducks are very difficult to count, making management of the species more an art than a science.

This year, biologists from several Southeastern states have joined forces to develop a program that will allow for a more accurate monitoring of wood duck populations.

The program, conducted in cooperation with biologists from North Carolina, South Carolina, Georgia, Florida and the U.S. Fish and Wildlife Service, is the first coordinated attempt to monitor the Southeastern wood duck population on a region-wide basis. "We can't monitor wood duck populations using aerial surveys of breeding or winter populations," said Dennis Luszcz, waterfowl project leader for the N.C. Wildlife Resources Commission. "Consequently, there is no effective index for wood duck populations."

Biologists will be using improved methods of capture and banding, wood duck box monitoring, standardized data, and increased recruitment monitoring to help them better understand population trends. "We feel fairly comfortable with wood duck populations," Luszcz explained, "but hunting pressure on these birds is increasing and we need to be able to detect any changes in populations. By improving our monitoring techniques and pooling data, we can better determine what is happening to the regional population."

The study could have implications for future hunting regulations. Currently, special early wood duck seasons in Southern states have been disallowed by the U.S. Fish and Wildlife Service until those states can positively show that additional harvest will not adversely impact wood duck populations in the Southeast. A better understanding of regional populations could also assist in tailoring hunting regulations so that wood ducks from Northern states are not overharvested. "The wood ducks hatched in Northern states run a gauntlet of hunters as they migrate South," Luszcz said. "They sustain higher rates of harvest. Some of the birds in the Southeast could probably be hunted a little more, but we can't allow more liberal seasons when the Northern birds are down here."

The study could also shed some light on the variables of behavior found in the region's wood duck populations. "We have three different physiographical areas in North Carolina," Luszcz said. "We are fairly sure that our mountain birds act differently from our coastal birds. They act more like wood ducks found in the North. The birds that breed or winter on our Coastal Plain may share more characteristics with birds that breed and winter in South Carolina's and Georgia's Coastal Plain. State lines mean nothing from a biological standpoint."

KARL MASLOWSKI

Hidden Treasure: *Because of their nesting and habitat preferences, wood ducks have traditionally been a species virtually impossible to count. However, biologists from North Carolina and other Southeastern states have begun a program that will allow for a more accurate monitoring of wood duck populations.*

More Trouble for Timberdoodles?

Debilitating Virus Discovered in Woodcock

A debilitating virus discovered last winter in woodcock in Virginia may mean more bad news for this already troubled gamebird species. The virus, known as a *reovirus*, was discovered in several woodcock taken from the Cape Charles area of the Eastern Shore, a major staging area for woodcock headed for North Carolina and other Southern wintering grounds. North Carolina is considered a major wintering ground for woodcock in the East.

Working with birds submitted from Cape Charles, researchers at the National Health Lab in Wisconsin isolated the *reovirus* in emaciated woodcock, and also in woodcock that appeared to be healthy. The *reovirus* — prevalent in the domestic poultry industry — inhibits the absorption of nutrients, causing emaciation, respiratory problems, stunted growth and arthritis in infected birds.

Woodcock populations along the Atlantic Coast in the bird's Eastern Management Unit have been plummeting for the past two decades, decreasing about 30 percent in that time. Until now, biologists have thought habitat destruction to be the main culprit for the decline, although some woodcock biologists believe that overhunting is also a factor driving the declines. The discovery of the *reovirus* in woodcock is sure to be a disturbing development for the biologists studying the bird.

"This virus does have potential to cause problems," said Brad Bortner, woodcock specialist for the U.S. Fish and Wildlife Service, the federal agency responsible for managing woodcock. "It is too early to say this is hurting woodcock, but if this disease is widespread, it certainly could be affecting populations."

The Eastern Shore is a major poultry-producing region, but, biologists said it could not yet be determined whether the *reovirus* was being spread to woodcock from the domestic poultry industry. "We don't know if this has always existed in the population and is not normally fatal," Bortner explained. "It could be that woodcock that were stressed last winter in the hard freeze succumbed to the latent virus, or woodcock caught the disease because they had become stressed by the cold weather. We don't know which came first."

THOMAS BURLEY

Woodcock Woes: *Biologists in Virginia last year discovered a debilitating virus in several woodcock on Cape Charles. If widespread, the disease could be yet another factor contributing to the declining woodcock population, which has plummeted about 30 percent in 20 years on the bird's Eastern Flyway.*

This winter, woodcock on Cape Charles will be monitored for the *reovirus*, said Gary Norman, upland gamebird research biologist for the Virginia Department of Game and Inland Fisheries. "I believe it is significant that the *reovirus* was found both in emaciated birds and in ones that appeared to be healthy," Norman explained. "We plan to monitor 100 birds between November and January. We'll be testing for the presence of the virus." The tests do not require that the birds have to be killed, he added.

Disease specialists at the National Wildlife Heath Lab said that eating woodcock infected with the *reovirus* should not cause health problems since the virus is destroyed by cooking.

To Curb Night Hunting

Poachers May Encounter Fake Deer This Season

State wildlife officers will use deer decoys this year for the first time in enforcement of night deer-hunting regulations in North Carolina.

Deer decoys, which are used in 38 states, are life-sized replicas of deer. The decoys will be placed on roadsides in pre-determined, safe locations. The area will then be staked out by wildlife enforcement officers. The decoys will be used only at night, when killing a deer is illegal. Persons shooting at the decoy will be charged with taking big game during closed season and taking big game with the aid of an artificial light. Conviction may result in penalties including automatic suspension of hunting license for two years, a minimum fine of $250, and any other punishment the court may impose.

Officers will not use trophy buck replicas as decoys, only does, spikes or bucks with small- to medium-sized racks. "We can't entice someone to do something they wouldn't do ordinarily. That would be entrapment. So, we won't use a buck with a big rack," said Col. Harold Ragland, chief of the Commission's Enforcement Division. "These decoys will be a tool that will help us improve enforcement of the night deer-hunting prohibition. We're after people breaking the law."

When choosing a site to set a decoy, officers will ensure there is no chance that people or animals, such as livestock, will be near the line of fire at any time the decoy is in use. The area behind the decoy will have an adequate backstop for shots coming from any angle along the road. Deer decoys may be used on private and public land, but only on private land with the landowner's permission.

— *Angela Dorman Hill*

It's a Dog's World, Too

Patrol Dog Joins Commission's Enforcement Efforts

State wildlife officer Mike Criscoe's enforcement of North Carolina's hunting and fishing laws is going to the dogs. But no one is complaining, least of all Mike.

Criscoe has a new partner named Link — a two-year-old German Shepherd that can sniff out deer meat hidden in a truck, find shell casings in a two-acre field, and take officers directly to a fisherman on the most remote riverbank.

Link is the first certified patrol dog used in wildlife law enforcement in North Carolina. His work has been confined to Wildlife District 3, an 11-county area from Wayne County to the Virginia border. Only three other states use dogs in wildlife law enforcement.

To catch a violator, an officer sometimes must sit for hours and wait until a person returns from the woods to his vehicle. But Link saves time by taking the officers directly to the sportsman.

"If we need to check someone who is hunting or fishing, or we suspect someone is violating a law, it could be hours before they return," said Criscoe, a wildlife officer for 14 years.

"We could sit and wait, or search for the person in the woods. If someone wanted to evade us, it would be easy. But Link can track a hunter or angler from their vehicle, and if a crime has been committed, we can file the charges," Criscoe said. Most sportsmen checked by wildlife officers are not breaking the law, so Link is trained to be non-aggressive, unless the officer is in danger. During a search, the dog always stays on the leash and under the control of his handler.

"The only time he would be released is when an officer is being assaulted," Criscoe said. During a demonstration in a section of Vance County woods, the dog never barked as he traced the path of a hunter from his truck to a tree. Link made his first cases in January 1990 after graduating from 15 weeks of specialized dog patrol school. The arrests came after Officer Criscoe questioned two men about trapping on someone's property without permission. The men denied the deed, but Link traced the trappers back to the property and officers found footprints at the site.

When the case came to court, the judge decided the dog wasn't lying. The men were convicted on the dog's ability to track. Other cases made by the dog and Officer Criscoe include hunting and fishing violations, and once the dog helped Vance County sheriff's deputies find a missing child. Link's intensive training makes his cases more credible in court.

Link returns to canine training school once a month for a refresher course. Then it's back to the woods. "Poachers sometimes may fool an officer, but they can't fool the dog," Criscoe said. "Sportsmen who've seen the dog in action support this effort. It's a better way to conserve the resource."

—Angela Dorman Hill

MELISSA McGAW

Dog Days: *This black German shepherd, named Link, is the first certified patrol dog to be used in wildlife law enforcement in North Carolina. Link can assist his owner, officer Mike Criscoe, in tracking and detecting violations.*

Field Notes

Season openings, closings and regulation changes.

Eastern Gun Deer Season	Closes Jan. 1
Central Gun Deer Season	Closes Jan. 1
Northwestern Gun Deer Season	Closes Dec. 1
Western Gun Deer Season	Closes Dec. 8
Black Bear	See *Regulations Digest*
Wild Boar	Opens Dec. 10
Gray Squirrel	Through Jan. 31
Fox Squirrel	See *Regulations Digest*
Rabbits	Through Feb. 28
Bobwhite Quail	Through Feb. 28
Ruffed Grouse	Through Feb. 28
Raccoon and Opossum	See *Regulations Digest*
Woodcock	Opens Dec. 6
Common Snipe	Through Feb. 28
Mourning Dove (winter season)	Opens Dec. 15
Ducks, Mergansers and Coot	Opens Dec. 13
Sea Ducks	Through Jan. 15
Snow and Blue Geese	Through Jan. 31
Brant	Opens Dec. 13
Swan (by permit only)	Through Jan. 31

Information on bag limits, either-sex hunts and other regulations may be found in the *1990-91 North Carolina Inland Fishing, Hunting and Trapping Regulations Digest.*

In addition to purchasing a federal duck stamp, North Carolina waterfowl hunters are required to buy a $5 state waterfowl stamp and should note areas where steel shot is now required.

Duck Hunters Vulnerable

Winter Boating Tips Prevent Drowning

Each year, the combination of cold water and cold air claims the life of duck hunters across the nation. Waterfowlers are at greatest risk because most are weighted down with heavy equipment, bulky clothes, boots and waders.

Sadly, many of these deaths could be prevented. Duck hunters often make the mistake of not putting on their life jackets, believing they are motoring only a short distance by boat to their blind. Even the best of swimmers, however, will have a difficult time swimming in 45-degree water. Cold water drains body heat 25 times faster than air of the same temperature. Loss of consciousness and subsequent drowning can occur in 15 minutes or less.

Hypothermia is the deadliest enemy for those who become wet in cold water. Always wear a life jacket. Without a life jacket, a swimmer must tread water to stay afloat. This swimming activity flushes heat from the body, further reducing survival time. Better yet, Coast Guard approved float jackets can improve heat retention. By wearing a lifesaving device and conserving energy, survival time can be doubled. As with wearing a seat belt in a vehicle, wearing a lifesaving device when on the water, especially in cold weather, is the single most important factor in safeguarding lives.

Overloading a boat with decoys, dogs, equipment and too many passengers is asking for trouble. Pay attention to the capacity load plates that are mandatory on your boat. If your boat is overloaded, take two or more trips to your blind or hunting spot.

If possible, duck hunters should avoid crossing large expanses of open water in rough weather. Following the shoreline helps you avoid large waves and capsizing.

N.C. WILDLIFE RESOURCES COMMISSION

Don't Drown: *Duck hunters are especially vulnerable to drowning because they are often overloaded with equipment in cold or rough weather conditions. Take necessary safety precautions such as wearing life vests.*

The 1991 North Carolina Wildlife Calendar Is Here!

With such artwork *as Judy Mizell's "December Snow" featured above, the North Carolina Wildlife Calendar is sure to sell out again this year.*

The works of Bob Timberlake, Patsy McAuley, Walt Obman, Bob Herr, Robert B. Dance, Jake Taylor, Robert C. Flowers Jr., James A. Brooks, Judy Mizell, Duane Raver and Dan Johnson are featured in the 1991 Wildlife Calendar. Order yours today by returning the form below with your check or money order to 1991 Calendar, N.C. Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, NC 27604-1188.

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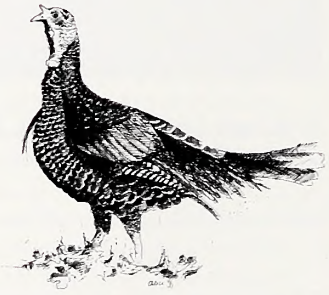
For fund raising and bulk rate information (10 calendars or more), call 919-733-7288. Please allow 6 weeks for delivery.

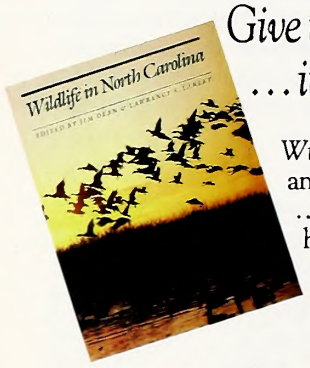
CALO91

Calendar

On several occasions, events in this calendar have been changed or canceled without notice. Readers should check the contact before traveling to an event. Listings for calendar should be sent at least four months in advance.

Feb. 2-3
The North Carolina State Chapter of the National Wild Turkey Federation will hold its annual state convention at Gateway Convention Center, Sheraton & Comfort Inns, Rocky Mount. Featured will be prominent wild turkey expert, Ray Eye of H.S. Strutt Inc. An awards banquet is scheduled for Friday evening, followed by the convention agenda and state championship wild turkey and owl-calling contests. For more information, contact Terry Hill, Seven Lakes, Box 608, West End, N.C. 27376, or call (919) 673-2982.





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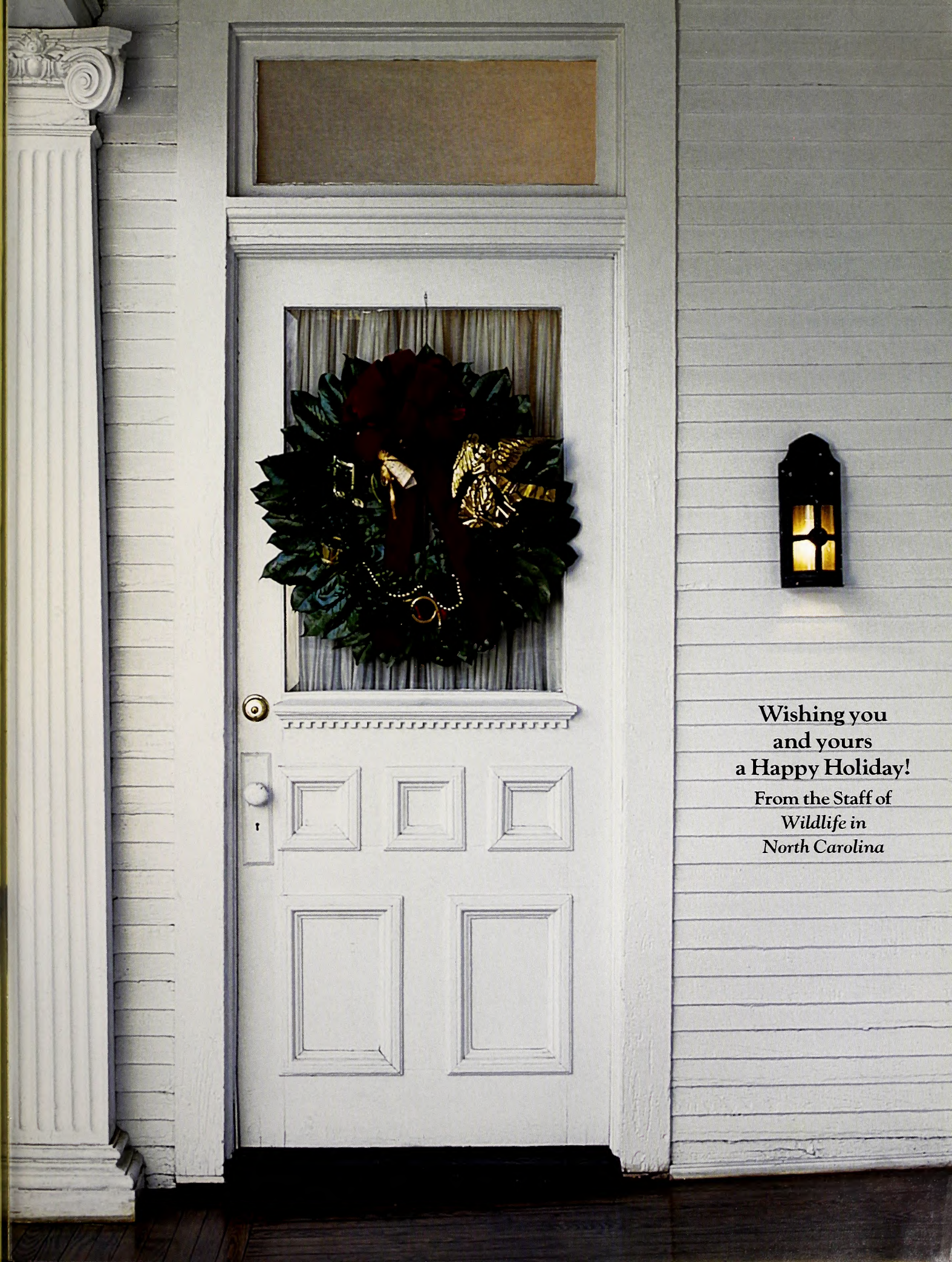

Wishing you and yours a Happy Holiday!

From the Staff of
Wildlife in North Carolina

Settling Down

To the eye, this is a peaceful scene of snow geese joining a gathering of waterfowl at dusk on Lake Mattamuskeet. The ear, however, would record it as a cacophony of quacks, honks and whistles.

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